# AVIATION WEEK

JULY 11, 1955

50 CENTS

A McGRAW-HILL PUBLICATION

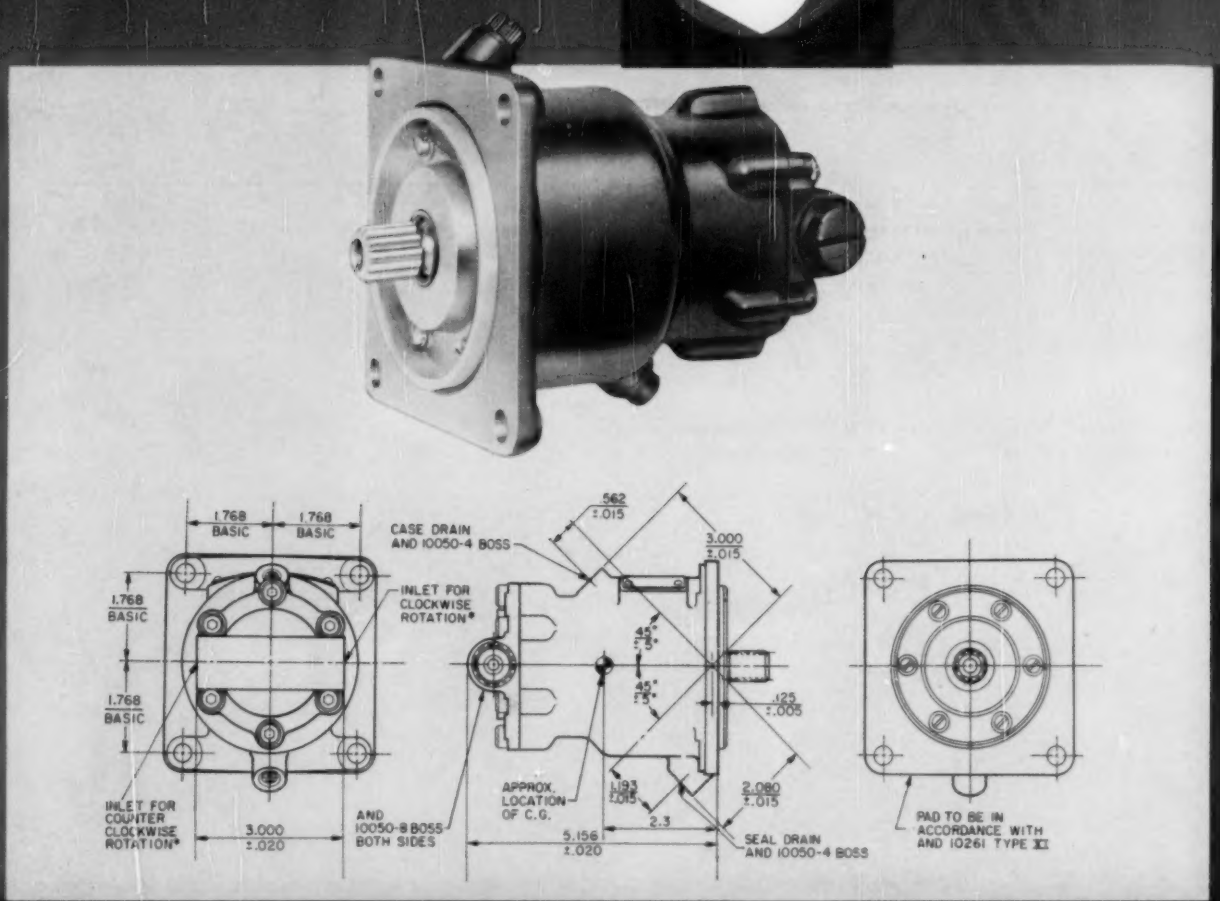
**TARGET: SUBMERGED SUB** The protecting cloaks of night, foul weather, and ocean are stripped from a submarine by the detection gear and skill of an S2F Navy crew. Pinpointed, the sub is sent to a point of no return—the bottom of the sea. All this equipment required a two plane hunter-killer team until Grumman packaged it into a single aircraft. Grumman S2F's are now operational with the Navy.

**GRUMMAN AIRCRAFT ENGINEERING CORPORATION** BETHPAGE • LONG ISLAND • NEW YORK

*Designers and builders also of the supersonic Tiger, Cougar II, Albatross amphibian, metal boats, and Aerobilt truck bodies*

*First in Constant Speed Drives...*

SUNDSTRAND




## NEW Sundstrand Aircraft Hydraulic Motors

Sundstrand Aviation announces a new line of Aircraft Hydraulic Motors having unusually high Hp/Wt ratio combined with long life at continuous duty.

Typical of this new line is the model illustrated, which has a displacement of 0.6 cubic inches. While it has a *continuous duty* rating of 25 hp at 6000 rpm at 3000 psi, it weighs only *5.9 lbs.!* Send for Bulletin 124 for more information about this and other motors of the new line. Your inquiry about special motors and controls is invited.

### High Hp/Wt ratio

1. Few component parts for maximum reliability
2. Small envelope
3. High operating speeds
4. Capable of continuous operation at 3000 psi at rated speed
5. High overload capacity—intermittent overloads to 5000 psi.
6. High torque-to-inertia ratios for rapid cycling or rapid reversing
7. Dynamically balanced
8. Operating temperatures of –65° to 275° F

# SUNDSTRAND AVIATION

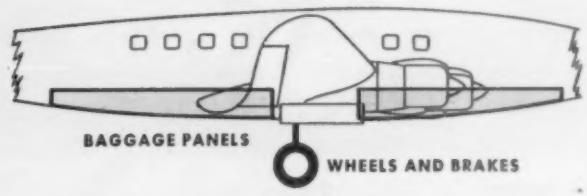
Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS • Western District Office: Hawthorne, California

**CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES**

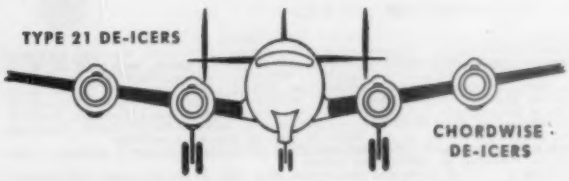
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

# Every time Northwest's new 1049-G's land, stop, get up and go—they rely on B. F. Goodrich

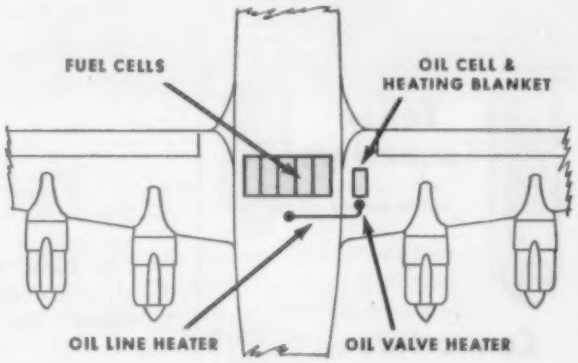
NEW LOCKHEED 1049-G Turbo Constellations—the latest addition to Northwest Orient Airlines' fleet—offer the ultimate in dependability.




**B. F. Goodrich brakes** stop this plane smoothly; give long service with low maintenance, more even wear. When fluid pressure is introduced, a full circle "tube" lifts each brake block evenly around the full circle of the drum. The entire braking surface is utilized. **B. F. Goodrich wheels** are made of magnesium alloy for great strength with light weight. The new **B. F. Goodrich baggage panels** are air-tight yet easily opened, strong yet flexible. Made of a glass fabric combined with a special rubber compound, they're opened by **B. F. Goodrich Pressure Sealing Zippers.**




The wings of Northwest's 1049-G's have the most efficient ice protection yet developed—new **B. F. Goodrich chordwise De-Icers.** The small rubber tubes that inflate to snap off ice are built chordwise, in line with the airstream. They maintain a smooth flow of air over the wings even during the 3-second inflation cycle. Like **B. F. Goodrich Type 21 De-Icers** on the tail, they remove ice effectively with a high pressure snap.

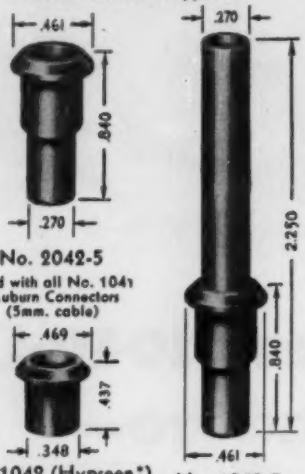



**B. F. Goodrich fuel cells** add to flight range, yet take up minimum space. **B. F. Goodrich oil cells** contain **electrically heated rubber "blankets"** that keep oil at proper temperature. **Heated rubber "jackets"** around oil valves assure positive action at all times. And **BFG oil line heaters** keep oil flowing freely.

These are typical examples of the many B. F. Goodrich aviation developments that help keep modern airliners on the go from take-off to landing. *The B. F. Goodrich Co., Aeronautical Sales, Akron, Ohio.*

# Auburn
## IGNITION ACCESSORIES

### Terminal Collars (Seals)
Ozone Resistant Hypreen*




No. 2042-5
Used with all No. 1041 Auburn Connectors (5mm. cable)

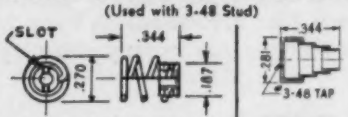



No. 1042 (Hypreen*)
No. 1043 (Silicone)
Used with all No. 1041 Auburn Connectors (7mm. cable)

No. 1042-5
Used with all No. 1041 Auburn Connectors (5mm. cable)

*Auburn Synthetic Rubber

### SPRING AND EYELET ASSEMBLIES
(Used with 3-48 Stud)




No. 1066-9A (AN 4164-22) with stainless steel coil springs

No. 1066-9V with Inconel volute springs

### Teflon Connectors
with Inconel volute springs

1041-TV (9/16")
1099-TV (1")

### Connectors with stainless steel coil springs

1041-C Steatite
1041-M Mycalex
1041-D Alumina
(AN 4164-2)

1099-C Steatite
1099-M Mycalex
1099-F Phenolic
1099-D Alumina
(AN 4164-1)

1041 1099

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Co. Inc., Auburn, N.Y.


# Aviation Week


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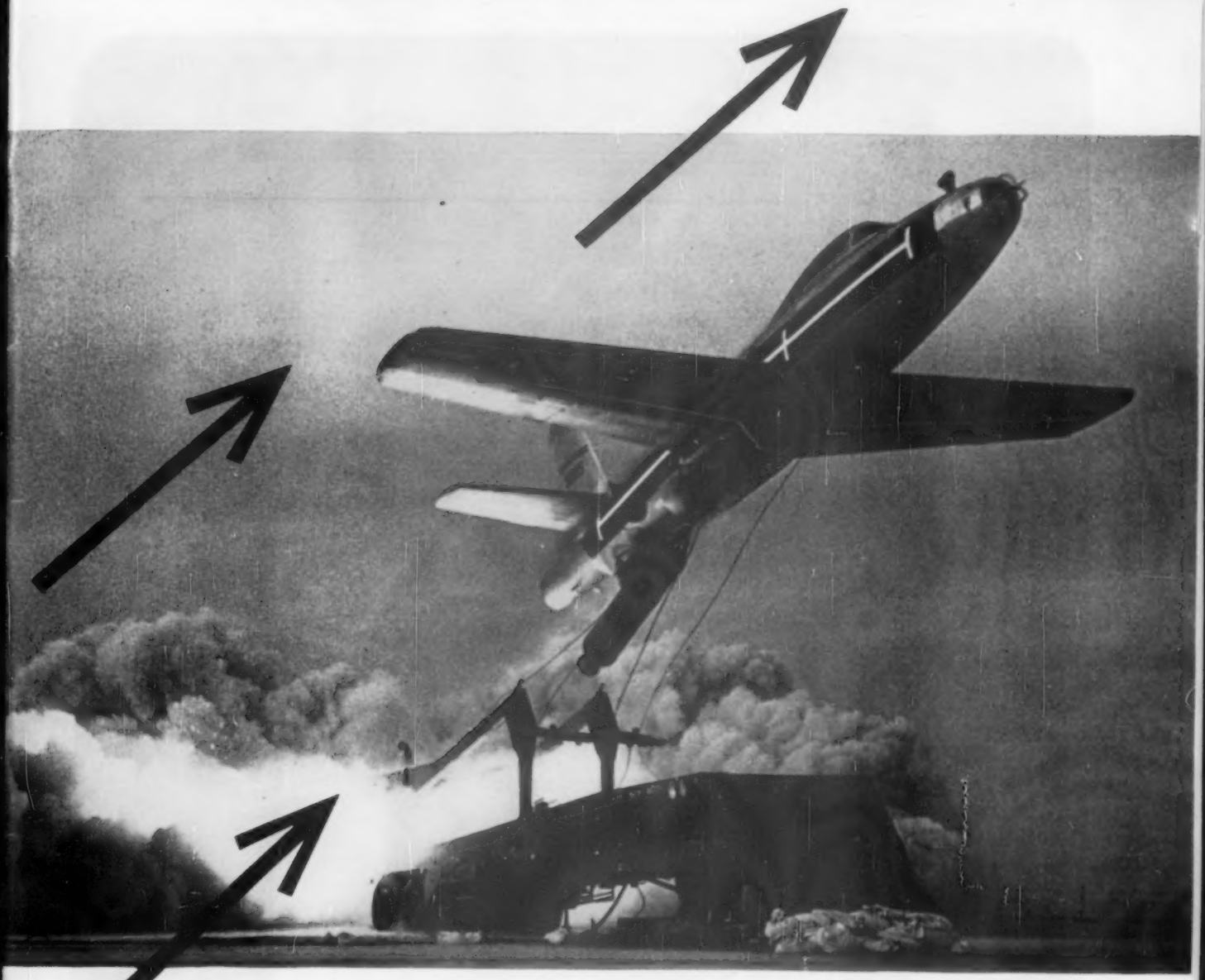


# the world's shortest runway

In the event of surprise attack with today's weapons, a single bomb could wipe out a whole area. Meanwhile, longer and heavier runways are essential to the operation of today's aircraft.

Because of this, the Air Force has long been concerned with the need for entirely new ways of getting its fighter planes into the air by means which would eliminate the concentration of aircraft in the vulnerable areas of forward bases.

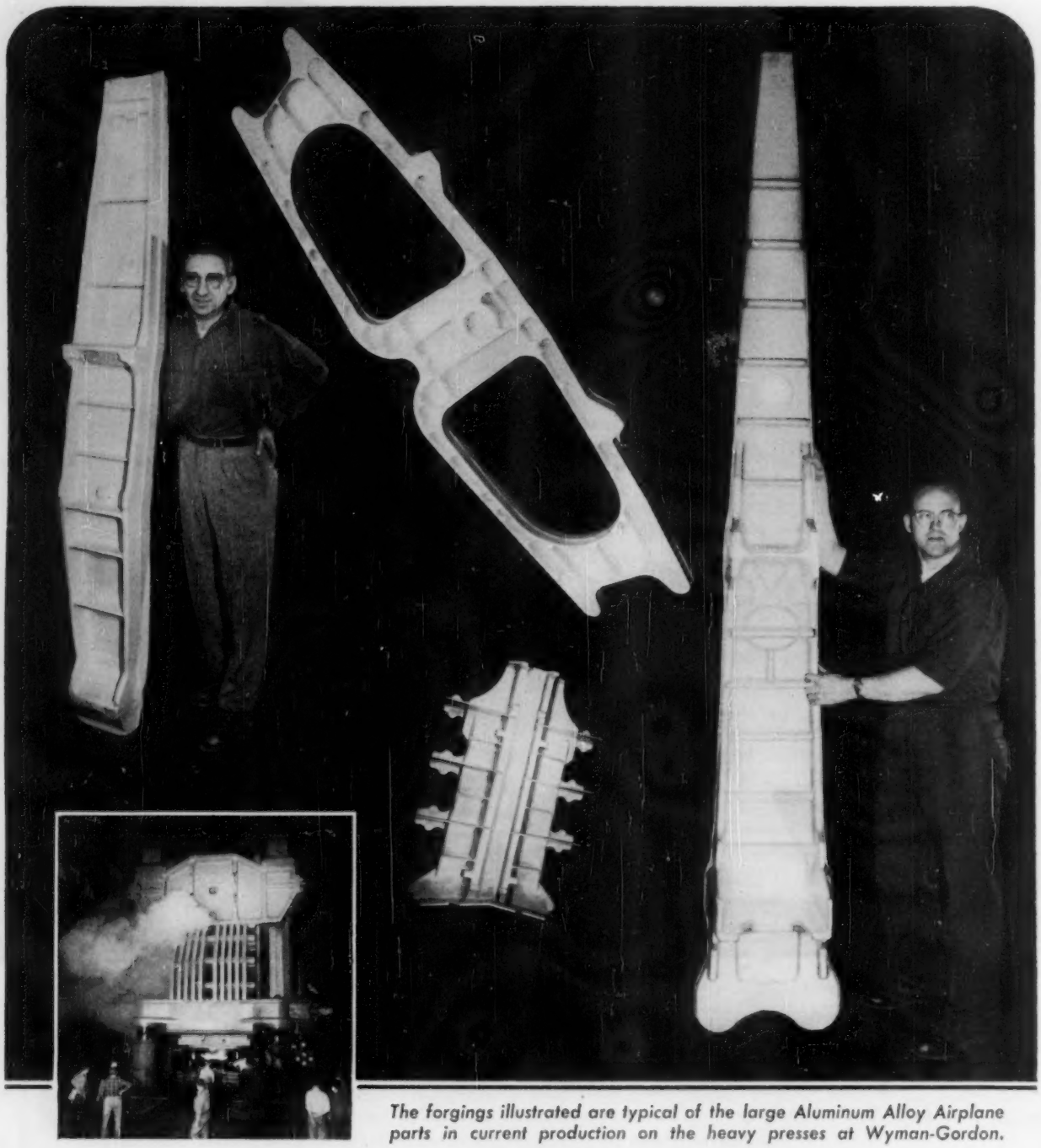
Martin engineers, working with the Air Research and Development Command, were given the job of finding a solution to this important problem—and shown here is their answer.

It is the world's shortest airstrip—a mobile zero-length launcher which is transportable by air or land and which operates in a space of only ten square yards. It is shown here blasting a piloted Republic F-84 into full flight without the necessity of any take-off run.

As an outgrowth of the work of the same Martin-ARDC team which produced the TM-61 Matador pilotless bomber and zero-length launcher, this important development is another example of Martin's contribution to American airpower and security.

**MARTIN**

BALTIMORE · MARYLAND



*The forgings illustrated are typical of the large Aluminum Alloy Airplane parts in current production on the heavy presses at Wyman-Gordon.*

A new era in the art of forging has been demonstrated as production goes forward on this 35,000-ton closed die forging press. Larger forgings with thinner sections and closer tolerances than heretofore possible open new concepts in forging design. Wyman-Gordon continues to pioneer by — Keeping Ahead of Progress.

# WYMAN-GORDON CO.

*Established 1883*

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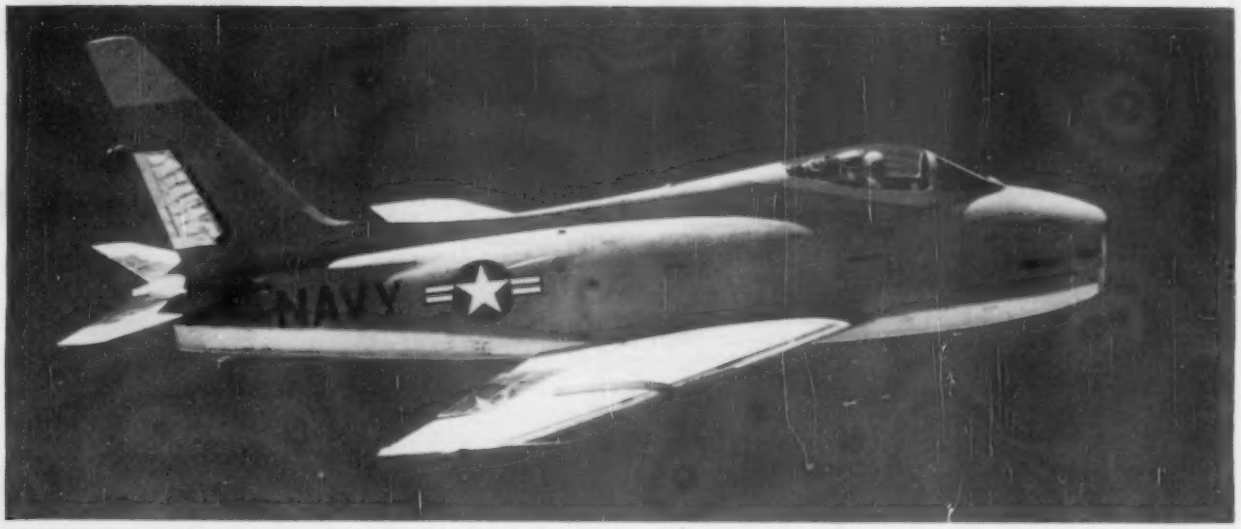
# NEWS DIGEST




**MID-SPAN CONTROL SURFACES,** a redesigned fuselage and thinner wings make the difference between this North American FJ-4 Fury and its FJ-3 predecessor. Location of movable controls is aimed at increasing their effectiveness by eliminating reversal due to airframe twist. Plain flaps are inboard of ailerons, which can be dropped to provide extra landing lift. Cockpit layout has been changed; it has slight droop on the leading edge. Powerplant is a Wright J-65-W-4, rated at 7,800 lb. static thrust. Armament is Navy standard of four 20-mm. cannon, plus external stores. New paint scheme, gray top, white bottom, is now Navy standard. Top speed of the carrier-based FJ-4 Fury is over 690 mph.

## Domestic

**Boeing 707 jet tanker-transport** prototype for KC-135 is being fitted with Boeing-developed Flying Boom aerial refueling system. Plane is expected to be flying with the refueling boom in August, according to a company spokesman.

**Guided missile reliability** is subject of USAF classified symposium to which industry is invited. Symposium will be held at Wright Air Development Center Nov. 2-4. British and Canadian groups may also attend. Write Mr. R. L. Dingle, Directorate of Weapon Systems Operations (WCSOP), WADC, Ohio.

**First production Convair F-102A** delta-wing supersonic all-weather fighter has been delivered to the USAF at Edwards AFB, Calif. Production airplane features a new paint scheme: grey fuselage and wings, black nose, and dull green atop the nose and engine intakes. Except for the nose, earlier models were unpainted.

**Contract exceeding $6 million** for an improved version of General Electric's remote controlled radar-directed B-47 armament system has been awarded by USAF to GE's Aircraft Products Department. New equipment is more efficient and easier to maintain, GE says.

**Brig. Gen. Clinton D. Vincent,** Deputy Chief of Staff for Operations, Continental Air Command, was found dead in his quarters at Colorado Springs, Colo., July 5. He was 40. Vincent attained general rank when he was 29. During World War II he shot down 16 Japanese aircraft and commanded the forward echelon of the 14th AF in the China-Burma-India Theater under Maj. Gen. Claire Chennault.

**Andre Planiol,** 61, consulting engineer for Stratos Division, Fairchild Engine & Airplane Corp., Bay Shore, N. Y., died June 30. Planiol founded Stratos after being smuggled out of France during World War II. The firm was later absorbed by Fairchild.

**Advanced Research Division** recently established by Hiller Helicopters, Palo Alto, Calif., will provide facilities for advanced and basic research into unconventional, convertible and vertical takeoff aircraft. New building for the division will be completed this fall.

## Financial

**Thompson Products, Inc.,** Cleveland, Ohio, has acquired Karl-Douglas Associates, Inc., Hawthorne, Calif., maker of hydraulic and pneumatic cylinders and valves, and will assist the firm's expansion in servo-mechanical systems for aircraft and missiles.

**Vitro Corporation of America,** New York, has purchased a substantial interest in Thieblot Aircraft Co., Inc., Bethesda, Md., an engineering firm working on design, development and production of aircraft components and ordnance systems. Thieblot plans additional facilities in Martinsburg, W. Va., to assist Vitro research in electronics, electro-mechanical and weapon system.

## International

**Vickers Supermarine 525,** prototype for a forthcoming Royal Navy fighter, crashed during recent flight. The pilot, Lt. Cmdr. Anthony Rickell, ejected at low altitude, but his chute did not have time to open and he was killed.

**New women's speed record** of approximately 715 mph. was set June 30 near Paris by Mme. Jacqueline Auriol flying a Dassault Mystere 4 jet fighter at 10,000 ft. and at 5,000 ft. The mark exceeds the former record of 675.4 mph. set by Miss Jacqueline Cochran in an F-86 Sabre at Edwards AFB, Calif., June 3, 1953.

**Total operating revenues** of Canadian airlines in January were $7,591,646, compared to $6,991,732 in January 1954, according to figures recently revealed by the Dominion Bureau of Statistics. Total operating expenses for the first month of 1955 were $8,393,418, compared to $7,781,418 in January 1954. Revenue passengers totaled 152,615 last January, compared with 131,336 in January 1954.



WHO'S WHERE

as others see us . . .

# A user tells how AETCO SERVICE helped him

—by L. A. Majneri
President &
Chief Engineer
AEROGUILD, Inc.

Recently when conducting tests on one of our experimental shuttle valves, we arrived at contradictory and inconclusive results. To cancel out the doubtful effects of our test procedure, we decided to secure the testing service of a competent, independent organization. We desired to obtain a cross-check of our results, and if possible, to procure some conclusive data.

Consequently, we chose AETCO to conduct this test since they are acknowledged specialists in testing and evaluating aircraft components. Their experience and background in the problems of aircraft hydraulic components well qualifies them to do such testing effectively.

AETCO tested the value for us promptly and efficiently. The result of their test furnished us, without delay and at reasonable cost, the basis for definite evaluation of our product. They rendered us excellent service, and will in the future receive first consideration from us on all test programs necessitating such outside testing service.

We are grateful that such service as theirs is available to us, and we should be pleased to recommend it to others who have similar testing problems.

Aetco

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*including*
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IN FLIGHT TESTING, TOO

AIRCRAFT EQUIPMENT TESTING COMPANY
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Designers who regard custom-made right-angle takeoffs as costly and unwieldy will find in ANGLgear a happy solution. They'll like its small size, sturdy construction, and high load capacity.

| Model & Type | HP | RPM | Ultimate Static Torque (in lb) | Wt |
|---|---|---|---|---|
| R-300 2-way | ½ | 1800 | 450 | ½ lb |
| R-310 3-way | ½ | 1800 | 450 | ½ lb |
| R-320 2-way | 1 | 1800 | 1500 | 2½ lb |
| R-330 3-way | 1 | 1800 | 1500 | 2½ lb |

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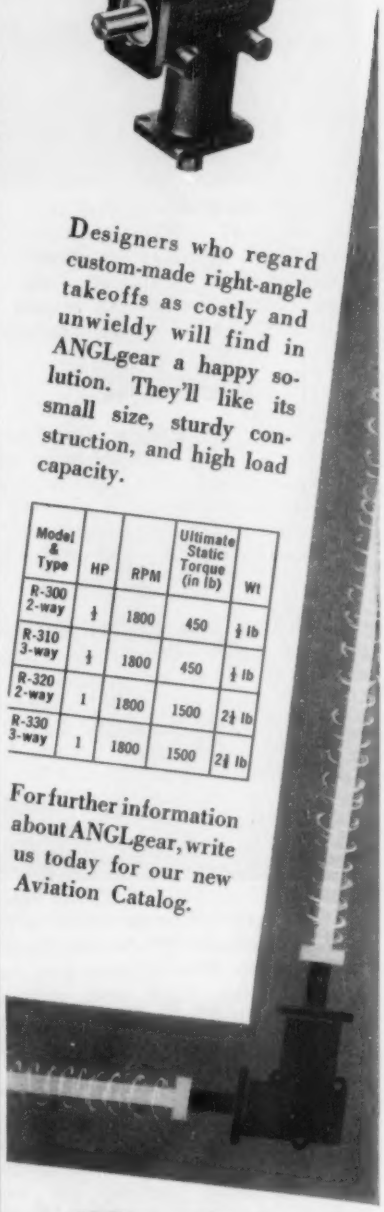

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# WHO'S WHERE

## In the Front Office

**Anselme Vernieuwe,** former operations head, Sabena Belgian Airlines, now executive vice president, **Valentin Pacco,** vice president-sales and **Marc Stainier,** vice president-operations.

**Milton L. Patterson,** vice president, Airwork Atlantic, Ltd., British certificated all-cargo airline.

**William S. Rheem, II,** vice president and director, Rheem Manufacturing Co., New York, N. Y.

**C. Hart Miller,** assistant to the president, Northrop Aircraft, Inc., Hawthorne, Calif.

**William M. Kerrigan,** assistant to the president of Bonanza Air Lines and director of public relations-publicity.

**Albert L. Nickerson,** president, Socony Mobil Oil Co., succeeding **B. Brewster Jennings,** named board chairman.

**Harry L. Smith, Jr.,** sales vice president, Aluminum Company of America, Pittsburgh, Pa.

**Joseph P. D'Arezzo,** divisional vice president, American Machine & Foundry Co.'s Defense Products Group, Alexandria, Va.

## Honors and Elections

**Andre A. Priester,** Pan American World Airways vice president, chairman of International Air Transport Assn.'s Technical Committee, succeeding **Raymond Dupre,** deputy director general, Air France.

**William Allen,** Boeing Airplane Co. president, to the board of trustees, Committee for Economic Development, New York.

**G. R. Edwards,** managing director, Vickers-Armstrongs Aircraft Division, to board of Vickers, Ltd.

## Changes

**Newell B. Terry,** former director of personnel administration, American Airlines, appointed director of personnel of the Department of the Interior.

**George S. Cooke, Jr.,** chief of Glenn L. Martin Co.'s Air Force Requirements Office, succeeding **R. L. Sansbury,** new director of European operations in London.

**John O. Wagner,** Washington representative of Defense Products Division, M. W. Kellogg Co., Jersey City, N. J.

**Ray Morris,** senior test pilot, electromechanical flight test section, North American Aviation, Inc., Los Angeles, Calif.

**J. Earl Steinhauer,** assistant to the general manager, Fairchild Aircraft Division, Fairchild Engine & Airplane Corp., Hagerstown, Md.; **Robert W. Martz** succeeds him as plant operations manager.

**David Boyd,** works manager, Rolls-Royce of Canada, Ltd., Montreal; **Kenneth J. Grundy,** production manager; **A. Maxwell Scott,** sales manager, Aviation Division and **A. G. Morrall,** assistant to general manager.

**Wolfgang A. Kittel,** U. S. general manager, Lufthansa German Airlines.

**W. E. Huskins,** operations manager, Orient Region, Northwest Orient Airlines.

(*Continued on page 72*)

# INDUSTRY OBSERVER

► General Electric's J79 turbojet has been flying for some weeks in a test bed rig slung under a North American B-45 bomber. J79 is scheduled for Convair B-58 supersonic bomber and Lockheed F-104 fighter. The fighter-bomber version of the F-104 is designed for Mach 2 speed with a range of 1,800 mi.

► **North American has proposed a two-place trainer version of the F-100 Super Sabre to indoctrinate pilots on supersonic flight. North American expects it will have a better chance to sell the supersonic F-100 trainer to USAF than the earlier subsonic F-86 two-place trainer.**

► First production contract for the LaCrosse, close support missile for the Army and Marine Corps, has been awarded the Glenn L. Martin Co. The contract calls for production of from 20 to 100 missile airframes. Development work on LaCrosse was done by Cornell Aeronautical Laboratory with flight testing at White Sands Proving Ground, N. M.

► **Douglas A4D Skyhawk now has a design gross weight of 15,000 lb., less than one-third the weight originally programmed during preliminary design stages. If Navy specifications had been followed to the letter in the Skyhawk design it would have weighed 47,000 lb.**

► New concept in helicopter instrumentation will be developed under Bell Aircraft contract with the Office of Naval Research. The new approach is expected to parallel a similar program for jet fighter cockpits stimulated by ONR.

► **Second P6M SeaMaster multi-jet flying boat is nearing completion at the Glenn L. Martin Middle River, Md., plant. Interior of the second plane differs from the prototype.**

► Vitro Laboratories is engineering guided missile systems installations for other Navy ships in addition to the Boston and Canberra missile-equipped heavy cruisers. Vitro also did systems engineering for the Boston and Canberra installations.

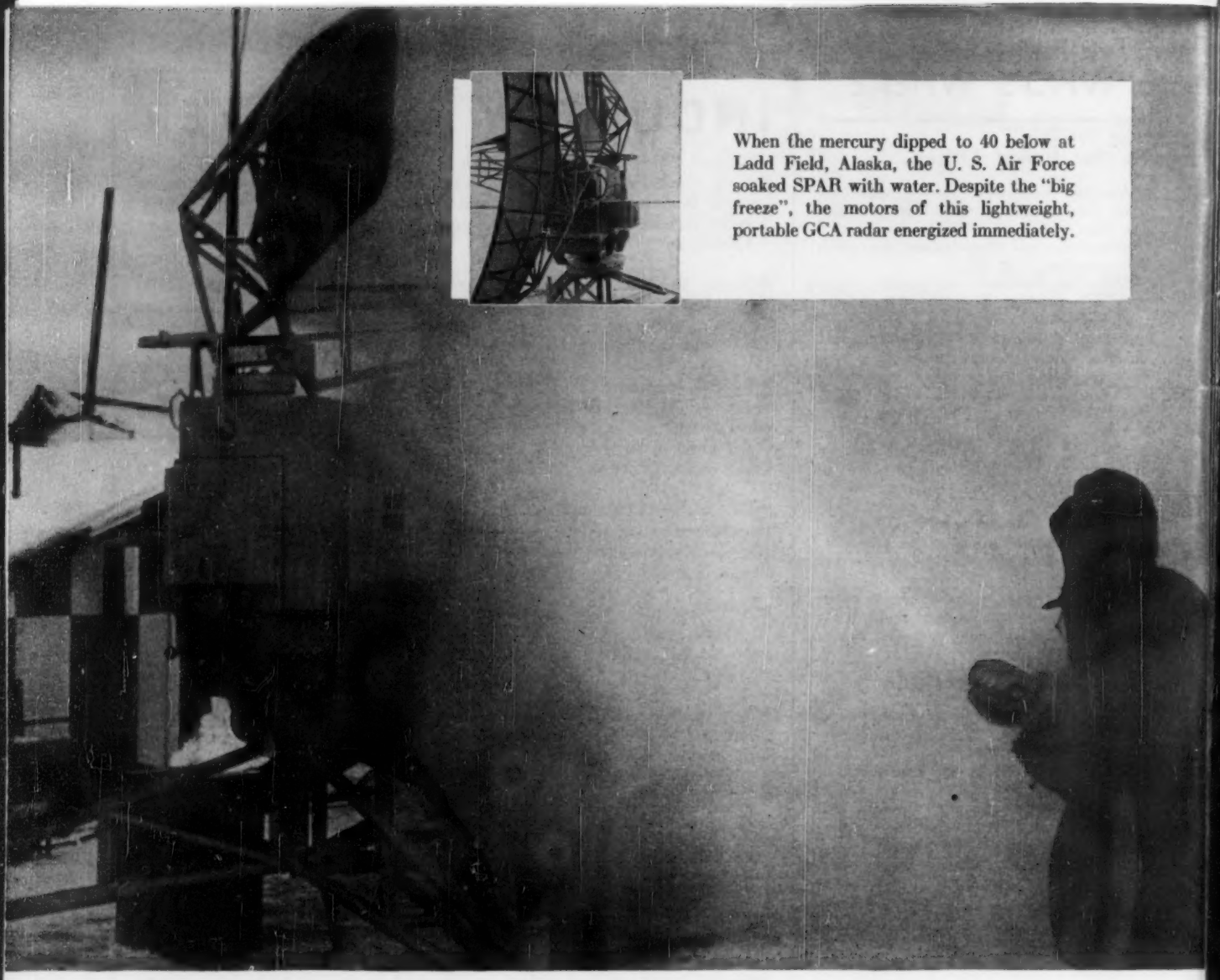
► **Effect of gunfire damage on aircraft structures in flight is being studied by a new method developed by the Air Force Armament Center at Eglin AFB, Fla. Specimen structures are hung on a long trapeze extended in flight from the bomb bay of a medium bomber. These tests give the effect of air blast on damaged structures that cannot be obtained by ground firing into a static structure.**

► Hypersonic shock waves can create an accurate but brief simulation of the airflow at the time of re-entry into the atmosphere of an intercontinental ballistic missile. All readings are taken at half a milli-second.

► **The Douglas RB-66 will be the last of the reconnaissance-bomber types used by Tactical Air Command. Future TAC recon planes will be adaptations of fighter types or reconnaissance designs aimed at equivalent fighter type performance.**

► Cornell Aeronautical Laboratory stability flight tests with the North American F-100 at Edwards AFB have no relation to the Super Sabre accidents last year. Original stability tests for supersonic aircraft were proposed in 1949 using the X-1. Four other aircraft had also been scheduled for this test before the F-100 was finally picked. Stability and control research has been a continuing project at CAL since World War II. Tests are also continuing at the Buffalo installation using a North American F-86 as well as a B-26.

► **Orenda 14 engine which powers the new Canadair Sabre VI is rated at 7,600 lb. thrust, up from the initial 5,800 lb. of the Orenda 2 engine. Engine weight has decreased from the 2,700 lb. of the Orenda 2 to about 2,400 lb. for the newer models, despite the addition of an extra turbine stage. Need for strategic materials has decreased almost 40%.**



When the mercury dipped to 40 below at Ladd Field, Alaska, the U. S. Air Force soaked SPAR with water. Despite the "big freeze", the motors of this lightweight, portable GCA radar energized immediately.

# SPAR'S assets can't be frozen!

More accurate than any comparable GCA landing system, SPAR has come through every rigorous test with flying colors. Neither freezing temperatures, torrid heat, blizzards nor monsoons have lessened its effectiveness. SPAR's accuracy, dependability and durability have been engineered into a unit so light, so easy to use that within thirty minutes of its arrival on the scene, SPAR can "bring 'em in on the button" in the soupiest weather imaginable. And amazing as it may seem, SPAR costs only 1/5th as much as any other GCA system in production.

No wonder the Air Force, the Navy, European governments, and airport managements are so vitally interested in SPAR — the most revolutionary advance in GCA radar.

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# Washington Roundup

## Pressure on Fred Lee

Elevation of Charles J. Lowen from Civil Aeronautics Administration consultant to deputy administrator is another indication of increased Commerce Department control over CAA and its administrator Fred B. Lee. The deputy administrator's post has been vacant since Lee moved up to the top CAA post in 1953. Lee made no secret of the fact that he did not want a deputy. Lowen's appointment is sponsored by Louis Rothschild, Undersecretary of Commerce for Transportation who like his predecessor, Robert Murray, is disturbed about CAA's program and administration.

## Talbott on Dispersal

USAF Secretary Harold E. Talbott has disclaimed responsibility for any tendency of prime contractors to cut off small business subcontractors in Southern California.

If they do, Talbott says in effect, it is not caused by any dispersal instructions from his office. In a letter to California's Republican Senator Thomas H. Kuchel, the Secretary also said he has no evidence "our production schedules are being retarded because of lack of clarification of Air Force dispersal policy."

## Quick Action on Airport Aid

House Commerce Committee is acting with speed on legislation providing $63 million in federal airport aid annually for the next four years. The Aviation Subcommittee held two days of hearings. The outlook is that the committee will report out the measure this week and the House will pass it before adjourning. It has already passed the Senate, unanimously (AW July 4, p. 83).

The House Committee may add language to pressure a solution to the increasing safety hazard in the vicinity of commercial airports from various types of military operations.

## Short Life Nike

Congress is going along with Army's request for an additional $160 million for Nike air defense installations in Fiscal 1956—but with some reluctance.

Senate Armed Services Committee noted that it was approving the request "notwithstanding a realization that this system may be outmoded within the next few years by new anti-aircraft systems having greater range that are now under development." The committee explained:

"The fact that something better is hoped for in the future would hardly justify a refusal to provide the best system that is feasible today. In these circumstances, however, it is important that the Nike system be constantly evaluated in relation to new developments in this field.

"We trust that this evaluation will be carried on by both the Appropriations Committees and the Department of Defense."

## R & D Headquarters: Where?

The Senate voted $6 million authorization for new headquarters for Air Force's Research and Development Command now located in Baltimore—but declined to go along with USAF's plan to locate it at Wright-Patterson.

Senate Armed Services Committee directed reconsideration of the location "with particular weight being given to the dispersal problem and to earlier recommendations on this subject." It was pointed out that a 1953 USAF study, headed by Lt. Gen. Orval Cook, then Deputy Chief of Staff, Materiel, recommended location at Andrews AFB, near Baltimore. "A conclusive case has not been made for Wright-Patterson as the most advantageous location," the Senate committee declared.

## Investigation Notes

• Count on Senate Banking and Currency Committee, headed by Sen. William Fulbright (D., Ark.), to turn over the task of investigating the 100 largest defense contractors to the Senate Preparedness Investigating Subcommittee. Defense Department compiled a listing of the "biggest" at the banking committee's request. Many members of Congress think it put forth a "false front": covering the period from mid-1953 (instead of mid-1950, the start of the military build-up) through 1954, it showed General Motors Corp. as having a "minus" volume of defense business (AW May 30, p. 15).

• Sen. Lyndon Johnson's (D., Tex.) illness raises the question of a new chairman or acting chairman for the Preparedness Subcommittee. The appointment is up to Sen. Richard Russell, chairman of the full Armed Services Committee. The top Democrat on the investigating subcommittee, and the logical selection for chairmanship, is Sen. Estes Kefauver (D., Tenn.). Other Democrats on the subcommittee are Sen. John Stennis (D., Miss.) and Sen. Stuart Symington (D., Mo.). If a substitute for Johnson to the fourth Democratic place is named, it would probably be either Sen. Henry Jackson (D., Wash.) or Sen Sam Ervin (D., N. C.), in that order.

• House Armed Service Investigating Subcommittee, meanwhile, is conducting its investigation of six specific contracts of airframe manufacturers on a "hush hush" basis. Orders have gone out that only three persons may discuss the investigation: Rep. Carl Vinson (D., Ga.), chairman of the full Armed Services Committee, Rep. Edward Hebert (D., La.), chairman of the subcommittee, and John Courtney, counsel. They have said little so far.

## Balboa Battle

Civil Aeronautics Board will expedite action on the Balboa interchange case to get it out of the way as soon as possible. The case has become hot in recent weeks as the long-standing feud between Pan American World Airways and W. R. Grace & Co. broke out in a battle over who should run the interchange with National Airlines. Each has filed a separate agreement with National, and the Board will have to decide who will connect with NAL at Miami. While PAA and Grace are exchanging heated remarks, Eastern Air Lines and Braniff Airways have quietly filed an agreement of their own. CAB is determined that the Balboa case, which has dragged on for years, will be completed as quickly as it can be processed.

## North American Still Fighting

North American Airlines is reported trying to get relief through the White House from the Civil Aeronautics Board decision to put the carrier out of business (see page 107).

**—Washington staff**

AVIATION WEEK

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# Scheduled Airlines Gross $555 Million

**Six-month totals indicate industry record of billion dollars this year, Aviation Week survey reveals.**

By Preble Staver

**Washington, D. C.**—Domestic scheduled trunklines will reach a record total of a billion dollars in gross revenues this year, according to an AVIATION WEEK survey. The billion dollar total will be about $100 million above the 1954 figure.

The trunklines in the first six months this year took in approximately $555 million in total operating revenues for an increase of 18% over the same period in 1954.

Early estimates indicate a net operating income for this group of about $55 million—$17 million first quarter earnings added to $38 million earned in the second quarter. This compares with the $33.6 million net reported for the 1954 half-year of which $2.8 million was in the first quarter and $30.8 for the second quarter.

The 18% gain in total operating revenues did not match the 19.5% increase in passenger traffic figures. This failure of revenue growth to equal or exceed the passenger traffic climb is the result of two trends:

- **A continuing** decline in mail revenues.
- **Further expansion** of coach services continues to depress the average return per passenger-mile.

### Traffic Gains

Total revenue passenger-miles for the trunklines in the first half totaled 9,331,000,000 for a gain of 19.7% over the same six months in 1954. The percentage gain was a slight drop from the 20.5% increase reported for the January-May period (see tabular box below).

In flying 9 billion passenger-miles, the air carriers handled 16,800,000 revenue passengers for a new six-month high which represents a 19.4% gain over the 1954 period. Coupled with the phenomenal traffic growth has been an equally good average passenger load factor situation (see box, above right).

The latter is perhaps the most significant traffic trend as load factors of the trunklines have exceeded the previous year's, month by month. The load factor accurately reflects the high rate of business that began last fall and became a boom in the first quarter this year (AW, April 18, p. 124). Average passenger load factor reached 62.9% in the five months January through May which was a good 2.6 points over the industry load factor of 60.3% registered in January-May 1954.

Traffic and revenue gains experienced by the trunklines this year are also being enjoyed by other segments of the air transport industry.

### Feeders Gain

The local service air carriers, reduced to 13 in April by the absorption of Pioneer Air Lines into Continental Air Lines, have made a spectacular showing

**Domestic Trunk Airlines Passenger Load Factors**

| | 1955 | 1954 |
|---|---|---|
| May | 63.45 | 61.43 |
| April | 66.39 | 62.51 |
| March | 62.20 | 59.20 |
| February | 60.57 | 58.71 |
| January | 61.67 | 59.81 |
| | **1954** | **1953** |
| December | 61.56 | 59.38 |
| November | 60.95 | 58.14 |
| October | 63.27 | 61.94 |

**Domestic Trunk Airline Traffic for January-May 1955 and 1954**

| Carrier | REVENUE PASSENGERS | | | REVENUE PASSENGER-MILES (000) | | |
|---|---|---|---|---|---|---|
| | Jan.-May, 1955 | Jan.-May, 1954 | Percent Increase | Jan.-May, 1955 | Jan.-May, 1954 | Percent Increase |
| American | 2,803,000 | 2,408,000 | 16.4 | 1,610,174 | 1,385,022 | 16.3 |
| Eastern | 2,784,000 | 2,291,000 | 21.5 | 1,496,096 | 1,247,042 | 20.0 |
| TWA | 1,424,000 | 1,274,000 | 11.8 | 1,005,301 | 923,653 | 8.8 |
| United | 2,076,000 | 1,634,000 | 27.1 | 1,406,977 | 1,041,952 | 35.0 |
| Subtotal | 9,087,000 | 7,607,000 | 19.5 | 5,518,548 | 4,597,669 | 20.0 |
| Braniff | 671,000 | 564,000 | 19.0 | 245,305 | 203,968 | 20.3 |
| Capital | 976,000 | 874,000 | 11.7 | 297,079 | 271,506 | 9.4 |
| Colonial | 158,000 | 141,000 | 12.1 | 59,677 | 35,767 | 10.9 |
| Continental | 262,000 | 213,000 | 23.0 | 92,858 | 76,860 | 20.8 |
| Delta | 894,000 | 713,000 | 25.4 | 422,670 | 323,186 | 30.8 |
| National | 571,000 | 440,000 | 30.0 | 425,295 | 327,746 | 29.8 |
| Northeast | 177,000 | 154,000 | 14.9 | 35,464 | 30,502 | 16.3 |
| Northwest | 454,000 | 391,000 | 16.1 | 280,438 | 257,361 | 9.0 |
| Western | 419,000 | 305,000 | 37.4 | 191,269 | 141,615 | 35.1 |
| Subtotal | 4,582,000 | 3,795,000 | 20.7 | 2,030,055 | 1,668,511 | 21.7 |
| Grand Total | 13,669,000 | 11,402,000 | 19.9 | 7,548,603 | 6,266,180 | 20.5 |

in the first half in all passenger traffic categories. Skyrocketing of the local line load factors has been the outstanding feature of the group's traffic growth. Preliminary reports indicate a 7 point increase in the load factor for the 13 locals. They show an average load factor of 42.9% this year as against 35.7% a year ago.

Revenue passengers carried by local airlines so far this year totaled 1,307,000 while revenue passenger-miles flown exceeded 240,000,000. This represented gains of 33% and 34%, respectively.

Not only was it a good half-year for the local's, but the growth trend which improved month by month should continue upward for the balance of the year.

### Subsidy Need Down

At the present rate of business the dependency on government support in the form of subsidy is being substantially reduced. The timetable for elimination of subsidy support of the local airlines has already been advanced, and the prospects are that it may be stepped up further.

Passenger and passenger-mile gains for the first five months of 1955 over the comparable period of 1954 for a selected group of carriers are: Allegheny, 24% and 35%; Central, 90% and 132%; Lake Central, 35% and 33%; North Central, 51% and 43%; Southern, 41% and 33%; and Trans-Texas, 26% and 29%.

The pace set by the domestic carriers was also maintained by the U. S. international flag-carriers. In the first half the international lines carried 1,560,000 passengers a total of 1,983,000,000 passenger-miles. This represented a traffic gain of 17%. The forecast for the summer months is for an even greater increase because of the seasonal rush of trans-Atlantic business which sees the average length of haul extended.

## Indians Looking at Red Jet Fighters

**New Delhi**—The possibility that India may shop around for Russian jet fighters is raised here, following the visit of Chief of Air Staff, Air Marshal Sobrito Mookerji and 11 senior Indian air force officers to Moscow for the Soviet air display. It is believed that Mookerji may have the opportunity to fly a late Russian jet.

The visit of the air force officers follows Prime Minister Nehru's recent trip to Russia, during which Indian military attaches in Moscow had their first chance to see something of aeronautical development in the Soviet Union.

## Russia Shows Jet Transport

Two new Russian aircraft types were displayed in a formal public air show for the first time during the Red Air Force Day celebration at Tushino Airport near Moscow on July 3. They were the Il-20 a four jet transport (AW May 23, p. 12) and a twin rotor 40 passenger military helicopter (AW June 20, p. 11).

The Il-20, featuring swept wings and four turbojets buried in the wings, made a surprise appearance during the fly-by that featured a total of 400 aircraft including all of the five jet bomber and fighter types displayed several months earlier during the mass flights over Moscow before and after May Day. The Russian jet transport is reported to be operating on cargo flights linking Moscow with Siberia and scheduled to go into service with Aeroflot, the Russian civil airline, in a 54 passenger version.

A half dozen twin-rotor helicopters landed on Tushino Airport, lowered integral ramps and disgorged jeeps, light artillery and troops in a demonstration of vertical assault tactics.

No new military types were shown but all of the types featured in May Day air parades appeared including:

- Bison four jet bombers—12 plane formation.
- Badger twin jet bombers—three plane formations totaling 54 planes.
- Bear turboprop bombers—seven plane formation.
- Farmer supersonic fighters—48 planes.
- All weather fighter—50 planes.

The MiG-17, absent from the May Day shows, made its appearance over Tushino in a 24-plane formation. The weather was bad with low ceilings, forcing the Russian planes down to 500 ft. for their sweeps across Tushino Airport. In addition to foreign diplomats, military attaches, the show was seen by the chiefs of staff of the Yugoslav and Indian air forces who were special guests (see story in column 1).

# Western Airpower Is Impressive At Geneva; Red Aircraft Missing

**Geneva**—Importance which the Western powers are attaching to aviation as a builder of diplomatic, strategic and commercial prestige was re-emphasized at the International Aero Show here. Russia disappointed everyone by not showing off aircraft as anticipated, but the Soviet was represented by a high ranking aviation leader, Gen. Beletski, head of civil aviation.

Following soon after the air displays at Paris (AW June 20, p. 16 and June 17, p. 17) and Ypenburg, the Swiss show, commemorating 50 years of flying, drew major exhibits from six nations and fighter aerobatic teams from five, including the U. S., and 150,000 spectators on one day alone.

The quality of the Western nations' exhibitions has been aimed at winning and holding allies, impressing and discouraging potential enemies and assisting in sales of aviation products. In part the high level here was dictated by the possibility that the Russians might show their equipment, and the West dared not run second.

"Failure" of the Russians was probably a misinterpretation of the Russian acceptance of the Swiss Aero Club's invitation. The Russians said they would "assiste" which usually interprets as "attend." The Swiss, however, interpreted it to mean "participate." Gen. Beletski attended, leading a delegation.

In the aerobatic performances at Cointrin, Geneva's international airport, the USAF was represented by the Skyblazers from Chaumont in North American F-86 Sabres. Other teams included Sweden's Saab J-29 Flying Barrels, Britain's Hawker Hunters, France's Dassaut Ouragans and Italy in Republic F-84 Thunderjets.

Most impressive feature of the show was the fly-by at low level by a SAC Convair B-36 from a base in North Africa. The USAF had another B-36 parked at the end of the runway.

Near the end of the show, a SAC Boeing B-47 flew by—too high and on the wrong side of the crowd to make much of an impression.

The Swiss crowd cheered, and the Russians are reported to have smiled when, as the U. S. bombers roared over, a USAF captain announced in French, "These are war planes but they are built for peace."

Quantitatively, France dominated the show, sending over virtually everything that it has developed.

It was reported that the USAF had offered the Russians refueling facilities at bases in southern Germany and passage for military aircraft, even though NATO's summer exercise "Carte Blanche" was in progress.

Besides the Russians, ambassadors and air attaches from six Iron Curtain countries were official guests along with the representatives of Western powers.

# Technicality Costs Dr. Zwicky Military Security Clearance

**Los Angeles**—Dr. Fritz Zwicky, research consultant for Aerojet-General Corp., Azusa, Calif., has been denied security clearance by the Defense Department under a technicality of the Armed Forces Industrial Security Regulation.

The regulation states that an alien who does not take positive action to become a U.S. citizen cannot hold security clearance.

Because Dr. Zwicky is a Swiss national and refused to apply for American citizenship, the Navy withdrew the clearance as an administrative decision based on his alien status.

"I'm a guest of the country so I won't question the decision," Dr. Zwicky said. He added, however, that he "was better off fighting Communism as a Swiss than as a naturalized citizen because I can travel unrestricted in all parts of the world."

Aerojet-General does not plan to protest the action against Zwicky, company President Dan A. Kimball told AVIATION WEEK.

"We will put him on unclassified work," Kimball said. "This action does not decrease his value to us."

Kimball said there has been no question of removing Zwicky from the company's scientific advisory board. The Aerojet president said the scientist's main value to the firm is not in his work with classified details but in his contribution in the field of ideas.

He said Zwicky has been doing research in the field of space satellite vehicles and in the future may also devote time to important meteorological studies.

The Bulgarian-born scientist has made many contributions to rocket and guided missile developments in this country.

In 1949, President Harry Truman conferred on Zwicky the nation's highest award for services rendered outside the U.S. by a civilian, the Medal of Freedom. This was for his investigations in Germany during 1945 into the development and manufacturing of such German weapons as the V-2.

Zwicky also is credited with proposing in 1943, prior to the defeat of Germany, that teams of U.S. scientists and engineers be trained for a mission of investigation in Germany after the war to take full advantage of technical advances in weapons made by Germany.

The scientist has been on the staff of the California Institute of Technology since 1927, becoming a full professor in 1942. He is the author of many publications on astro-physics.

Zwicky, together with Theodore Von Karman, was one of the founders of the Aerojet company. He served as a research director there from 1943 to 1949, when he became chief research consultant and a member of the company's technical advisory board.

During World War II, the scientist served as technical advisor for the Office of Civilian Defense. He is a Fellow of the American Physical Society and a member of the Astronomical Society of the Pacific.

**NACA Tests Wing Extensions on F-86**

**Improved lift characteristics can be given sweptback wings under some flight conditions by lengthening the wing chord, NACA scientists have determined after extensive wind tunnel and flight test program. Here Ames Aeronautical Laboratory research pilot prepares to test wooden leading edge extension on standard F-86 Sabre wing at Moffett Field, Calif. The extender shown in photograph is fabricated of wood for research.**

## Aerojet Could Build Space Satellite Now

**Los Angeles**—Aerojet-General Corp. could start immediate construction of a successful space satellite vehicle, company President Dan A. Kimball said last week.

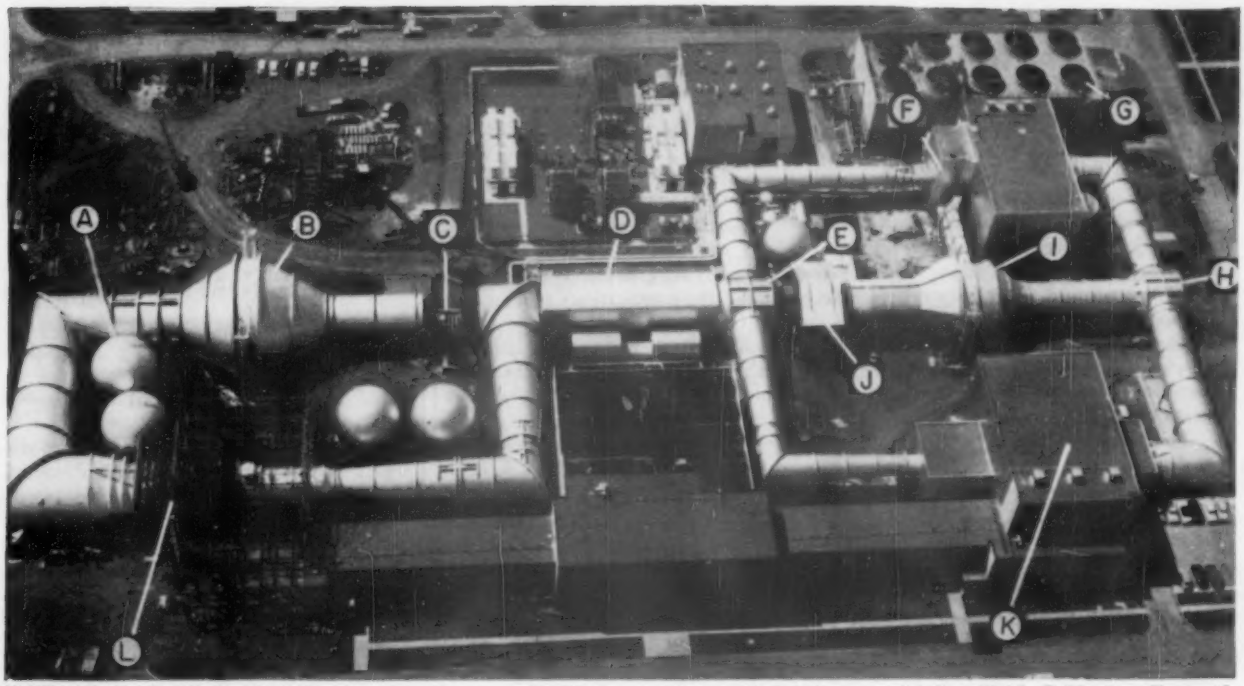
"We can give them a delivery date and a fixed price on the contract," he said. Work on the space satellite would be done in stages, according to the Aerojet executive.

First step would be research in "shooting pieces of metal off the earth." This would be followed by firing of a 50-lb. vehicle, which would orbit at a distance of between 200 and 400 mi. above the earth while maintaining radio contact.

This vehicle could be followed by a 100-lb. object, then a 1,000-lb. device, and finally "something you can get people in," Kimball said.

## Oberth at Redstone

Dr. Hermann Oberth, a pioneer advocate of interplanetary flight, has joined the U. S. Army Ordnance Guided Missile Development Center, Redstone Arsenal, Huntsville, Ala. Oberth's major contribution to rocket engineering was the publication in 1923 of a detailed mathematical treatment of interplanetary travel.




**UNITARY PLAN WIND TUNNEL** nears completion at NACA's Ames Aeronautical Laboratory, Moffett Field, Calif. It will provide three test sections covering speed ranges from Mach 0.7 to 3.5. The photo shows: A) dry air storage spheres; B) aftercooler; C) 3-stage axial-flow fan; D) drive motors; E) flow diversion valve; F) 8x7-ft. supersonic test section; G) cooling tower; H) flow diversion valve; I) aftercooler; J) 11-stage axial-flow compressor; K) 9x7-ft. supersonic test section; L) 11x11-ft. transonic test section.

# Ames Unitary Tunnel Nearly Complete

By Irving Stone

**Moffett Field, Calif.—A unitary plan wind tunnel, uniquely combining a transonic with two supersonic facilities and spanning a speed range from Mach 0.7 to Mach 3.5, will commence operation late this year at the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics.**

**One of three NACA unitary plan wind tunnels designed to provide continuous study for industry on planes, missiles and engines in development, rather than to augment NACA's basic research, the Ames tunnel will serve as a tool to:**

- **Prove new or future specific designs in model stages of development.**
- **Study problems arising in connection with aircraft or missiles which are presently in development or operational stages.**

Already, Ames administrators have had preliminary discussions with representatives of several aircraft companies for tests projected for both aircraft and missiles.

## Initial Tests

Some of these aircraft and missiles are in existence, others are still on the drawing board. Initially, tests probably will include stability and control investigations and flow measurements in ducts.

Configurations to be development-tested are almost entirely in the military service category, although a certain block of time will be retained for studies of commercial planes.

The Ames unitary tunnel will accommodate models with an average wing span of 3.5 ft., in general larger than can be handled in most supersonic tunnels operating today. Models of planes or missiles will be supplied by industry, but actual tunnel tests will be conducted by personnel of the Ames Laboratory.

Ames laboratory will cooperate closely with the aircraft or missile builder in connection with particular development tests. After a test has been approved and scheduled, the builder's representatives will move into a private shop facility in the laboratory, where initial model preparation and special instrumentation can be made just prior to the evacuation of a particular tunnel section by a previous user.

Since there are three tunnel sections in the Ames unitary plan wind tunnel system, it is conceivable that there could be three users while representatives of three other companies could be preparing, in the allotted shop facilities, for testing to be initiated as soon as each section is free.

## Computer Arrangements

The private shop facilities offered by Ames would insure secrecy where security classification or proprietary interests were involved. One highlight of the Ames facility is its computor setup —a combination of commercially available electronic components put together by Ames technicians for application to the three sections of the facility.

The computing machine reduces complex test results quickly, plots them on charts while the run is in progress, permitting current evaluation of the test program. This allows aerodynamic problems to be detected as they occur and may save considerable unnecessary testing.

Here's how the computer works: it converts analog output signals from the model instrumentation to digital form, performs calculations to make necessary correction to these data in accordance with predetermined conditions, and converts them to the form required for final presentation, such as non-dimensional coefficients of lift, drag and pitching moments.

A single point of this final data is

## Unitary Wind Tunnels

**The three new wind tunnels designed for development studies from Mach 0.7 to five times the speed of sound are going into operation this year at NACA's Ames, Langley and Lewis laboratories.**

**These three tunnel facilities, along with those at USAF's Arnold Engineering Development Center at Tullahoma, Tenn., are being constructed under the authority of the Unitary Wind Tunnel Plan Act of 1949, projected to meet the growing need for development research in supersonic flight.**

**Strategic requirements during World War II caused NACA to emphasize development research, and the balance between this effort and the organization's fundamental research was upset.**

**Also, it was obvious that, because of aircraft and engine performance progress, development testing would have to be accelerated. As a result of this situation, the unitary wind tunnels were projected to restore the proper balance of effort between development research and basic research.**

**The new NACA tunnels will take over the development test load from other tunnel facilities, so that the latter can be devoted essentially full time to NACA's research problems of a fundamental nature.**

expected to be obtained about one minute after the analog output signal is taken.

### Mach Ranges

The Ames unitary plan wind tunnel will have:

- **An 11x11 ft. transonic** test section with a Mach range of 0.7 to 1.5.
- **A 9x7 ft. supersonic** test section with Mach range of 1.4 to 2.6.
- **An 8x7 ft. supersonic** section for handling Mach values from 2.4 to 3.5.

Calibration tests are just beginning in the 9x7 ft. circuit.

NACA's Langley Laboratory counterpart of this tunnel, also devoted to development studies of planes and missiles, will operate over a Mach range of 1.2 to 5, using two separate nozzles and 4x4 ft. test sections. First investigations are presently scheduled for this summer.

NACA's Lewis Laboratory counterpart, now in final construction phases, will handle development studies of propulsion units. Mach range will be 2 to 3.5 in a single 10x10 ft. test section.

Studies also will be made of air inlets, inlet diffusers, internal ducting, jet exits and miscellaneous components associated with propulsion systems.

Studies on the air inlets alone should pay big dividends. Already, matching of specific supersonic plane inlets to jet engines has proved to be a critical problem indicating that considerable development effort will be required (AW July 4, p. 15).

### Programming and Scheduling

Test programs and schedules of all these unitary plan wind tunnels will be coordinated through two allocation and priority groups already established—one for aircraft and missile projects, another for propulsion projects. These groups are made up of one member and one alternate each from Air Force, Navy, Army, and NACA.

The three-in-one tunnel arrangement at Ames was evolved because it was found that satisfactory test section flow fields throughout the desired Mach number range could best be provided by three separate nozzles.

Construction of these separate nozzles was considered economically feasible only if they could be operated from a single source of power, because the drive system is the most expensive item of a large tunnel. Drive consists of four tandem-mounted wound-rotor motors with a combined rate output of 180,000 hp. with a boost up to 216,000 hp. for limited intervals.

### Two Compressors

Because of the wide variation of flow requirements of the three nozzles and the limited range of flow quantities over which a compressor can be designed to operate efficiently without complexity, it was not feasible to design a single compressor to operate all three circuits.

An 11-stage compressor at one end of the motor drive system supplies either of the two supersonic wind tunnels.

Compressor output is directed by flow diversion valves through the circuit being used. Guide vanes rotate with the valve and serve in either position to guide the air smoothly around the corner.

The total rotation of the valve, taking only about 3.5 min., is done only when tunnel is stopped and opened at atmospheric pressure.

The compressor will handle about 90 tons of air per min., increasing its pressure about 3½ times. Leaving the compressor at about 450F, the air is cooled subsequently to 120F.

Driven from the opposite end of the drive motor assembly is a three-stage compressor to operate the transonic circuit.

This large section requires the compressor to circulate air at about 290 tons per min., approximately five times the rate of flow of the 11-stage compressor for the supersonic sections.

## Thomas Reversal Now Allows Missile Displays

Navy Secretary Charles Thomas, reversing his order banning all public display of guided missiles, will now allow them to be shown publicly, subject to some restrictions.

The new Navy order said public display of new guided missiles and experimental aircraft will have to be specifically approved by Navy headquarters in the Pentagon. However, operational missiles, such as the Vought Regulus, Sperry Sparrow and Convair Terrier can be publicly displayed with special painting to disguise their component parts.

Obsolete missiles such as the Loon, Gorgon and Lark and research missiles such as the Martin Viking can be displayed without restrictions.

New missiles such as the Talos anti-aircraft weapon, the Petrel anti-submarine device, and the Sidewinder air-to-air missile cannot be shown publicly yet.

Thomas' sudden order barring all Navy missile displays occurred just before Armed Forces Day and forced cancelation of exhibits including the Sperry Sparrow that had already been approved by Navy. USAF and Army did not follow the Navy lead on the missile display policy and were well represented in the Armed Forces Day shows with various missiles.

## Neumeyer Selected As ACC Secretary

William Neumeyer, a former Navy pilot and veteran of World War II and Korea, has been picked by Louis Rothschild, Undersecretary of Commerce, as the new executive secretary of the Air Coordinating Committee.

Approval from all ACC members is needed before the appointment becomes official.

Neumeyer will succeed F. Lee Moore, who, a short while ago, submitted his resignation to be effective July 31. Moore plans to return to the aviation industry.

Neumeyer served as an anti-submarine patrol bomber pilot in World War II and was recalled to active duty for the Korean war. He has been in business on Long Island since leaving the Navy after Korea.

# $7.2 Billion for Planes in 1956 Budget

The $31.8 billion defense budget for Fiscal 1956 includes $7.2 billion for the procurement of 4,000 new aircraft by Air Force and Navy—a substantial increase over the $4.7 billion for Fiscal 1955.

USAF's slice of over $6.3 billion—more than double the $2.7 billion for Fiscal 1955 aircraft and related procurement—provides for 2,400 new planes.

The $906 million for naval aircraft procurement, the amount asked by Navy, is less than half the $2 billion for Fiscal 1955. It will finance 1,600 new planes. The reason for the cutback: Navy will start off the fiscal year with a big carry-over of unobligated funds, an estimated $800 million, because of large-scale cancellations of outmoded planes and engines. Starting with Fiscal 1957, naval aircraft procurement funds will increase sharply. Procurement of 2,400 new planes annually, 800 more than for Fiscal 1956, will be required to keep a 16 air carrier group fleet modern, Navy estimates.

This was the outcome, in the Defense Appropriation Bill sent by Congress to the President, of proposals made after the disclosure of Russian aircraft advances by AVIATION WEEK (May 23 p. 12):

• **The $206 million** additional requested for a 35% step-up of production of the B-52 bomber was approved.

## Fiscal 1956 Defense Money

**This is how defense appropriations for Fiscal 1956 compare with Fiscal 1955:**

| | FY 1955 | FY 1956 |
|---|---|---|
| Secretary of Defense | $12,750,000 | $12,670,000 |
| Interservice Activities | 527,500,000 | 682,250,000 |
| Army | 7,619,066,986 | 7,329,953,000 |
| Navy | 9,712,823,500 | 9,118,179,556 |
| Air Force | 10,927,930,000 | 14,739,763,170 |
| Total | $28,800,070,486 | $31,882,815,726 |

Meanwhile, Congress awaited an Air Force request for more money to speed up production of two new supersonic fighters—the long range McDonnell F-101 and the Lockheed F-104 day fighter. Secretary of Air Force Harold E. Talbott, on the advice of USAF's Chief of Staff, Gen. Nathan F. Twining, has informed Congress that production of these two types should be accelerated (AW June 27 p. 12). Defense Secretary Charles E. Wilson was expected to approve Talbott's decision.

• **The Air Force** was directed that plane procurement "be accelerated to the extent possible consistent with proven technological developments and efficient application of appropriated funds." This dictum was stated in the joint report of the House and Senate on the Defense budget. USAF's failure to obligate procurement funds by letting contracts has aroused widespread congressional criticism.

• **The Secretary of Defense** was given authority to transfer up to $50 million from other military categories for "emergency" projects. Defense Department asked for transfer authority for $200 million to finance research and development projects, should there be any unanticipated "break-throughs" during the year. The full $35 million specifically requested for the "emergency" fund was approved.

The $570 million provided for USAF's Fiscal 1956 research and development program is $152 million more than the Fiscal 1955 allocation. The $165 million earmarked for naval aviation research, though, is $7 million less.

# Wilson, Jackson Clash Over Airpower

A tangle between Washington's Sen. Henry Jackson (D.) and Secretary of Defense Charles Wilson kept alive the debate on the relative status of U. S. and Soviet airpower, touched off by AVIATION WEEK's disclosure of Russian technological advances (AW May 23, p. 12).

Jackson is chairman of the Subcommittee on Military Applications of the Joint Congressional Committee on Atomic Energy and a member of the Armed Services Committee.

Calling for "crash basis" production of jet bombers and fighters, Jackson directed 12 questions to Wilson, aimed at decisively settling U.S.'s airpower position and requested replies "as explicit and categorical as possible."

Wilson replied that "these questions are such that I do not feel that they should be answered categorically except to an appropriate committee of the Congress in closed session." Wilson added that, "full information concerning our defense programs and our evaluation of Russia's military potential has been presented to the appropriate committees of the Congress, including several of which you are a member.

"The Defense Department is well aware of the problems, and, I assure you that appropriate and effective actions have been taken from time to time as the world situation changed or as additional information became available. . . ."

Commenting that "to the best of my knowledge you have never expressed your own views on these questions before any committee of the Congress of which I am a member," Jackson replied by requesting Wilson to furnish written answers on a closed-door basis to his military applications subcommittee "by the end of next week." Jackson commented that the questions he submitted dealt with matters which "are for the most part already in the public domain."

Before submitting the questions to Wilson, Jackson in a public speech declared that he was "troubled by the massive and growing evidence of the extraordinarily rapid progress the Soviet Union is making in the field of airpower" and urged that these six steps be taken:

• **First.** I propose that our production of jet bombers and fighters be placed on a crash basis at once—on a war-time footing.

• **Second.** I propose that there be an expansion of our present aircraft industrial capacity. Existing aircraft plants should now operate around the clock, seven days a week.

• **Third.** I propose that we immediately convene a board of top industrial experts to determine why we are now slower than the Soviets in tooling up for the mass production of aircraft. We cannot prevent wars with models sketched on drawing boards.

• **Fourth.** I propose that we immediately assign supreme and overriding importance in our defense effort to the development of the intercontinental ballistic missile. This project must be tackled with the resources, the skills, the monies, the urgency, and the pri-

## RETMA Grows

**Growing interest of aircraft manufacturers in avionics industry is reflected in membership list of Radio-Electronics-Television Manufacturers Assn., trade organization with national headquarters in Washington.**

**Convair Division of General Dynamics Corp., and Boeing Airplane Co. have been members for about six months. Last week RETMA announced North American Aviation, Inc., has been elected to membership.**

**RETMA is composed of 389 manufacturers of electronic equipment.**

ority given our war-time atomic effort. The question of war or peace may depend on our getting this ultimate weapon first.

• **Fifth.** I propose that, as an absolute minimum, our ground forces be kept at their present level. Proposed cuts could be disastrous.

• **Sixth.** I propose that we immediately undertake to expand our atomic weapons program.

In a letter Jackson posed these 12 questions to Secretary of Defense Charles E. Wilson, requesting replies "as explicit and categorical as possible, since the very survival of our nation may hinge upon remaining decisively and unquestionably ahead of the Soviets in these fields":

**One.** Is it accurate to say that the Soviets may now be quantitatively equal to us in the production of long range jet bombers?

**Two.** Is it accurate to say that, even with the proposed 35% acceleration in B-52s, the Soviets may have more long range jet bombers in their air force by 1958 than we will?

**Three.** Is it accurate to say that the new day fighter and all-weather interceptors recently unveiled over Moscow in operational numbers are better planes, performance-wise, than any comparable aircraft we now have in squadron service?

**Four.** Is it accurate to say that, in terms of numbers of advanced fighters in operational service, the Soviets are now overwhelmingly ahead of us?

**Five.** Is it accurate to say that the Soviets have produced and flown jet engines with greater thrust than we ourselves have?

**Six.** Is it accurate to say that our defense planners underestimated the date on which the first Soviet long range jet bomber was flown?

**Seven.** Is it accurate to say that our defense planners underestimated, by a very considerable margin, the date on which the Soviets would fly operational numbers of their long range jet bombers?

**Eight.** Is it accurate to say that the Soviets have been able to tool up for mass production of aircraft more quickly than we have—in other words, that their lead time from the design of prototype aircraft to mass production models is shorter than ours?

**Nine.** Is it accurate to say that, by 1960, the Soviets will probably have more scientists and engineers working in the airpower field than we ourselves will have?

**Ten.** Is it accurate to say that, if present trends continue, the Soviets may be ahead of us in airpower—both quantitatively and qualitatively—by 1960?

**Eleven.** Is it accurate to say that the Soviets may achieve a continental ballistic missile—one with a 1,500 to 2,000 mile range—before we will? If so, what degree of likelihood do you attach to this possibility?

**Twelve.** Is it accurate to say that the Soviets may achieve an intercontinental ballistic missile before we do? If so, what degree of likelihood do you attach to this possibility?

## New Board Set Up For Engine Planning

Recent unexpected shifts in engine requirements that resulted in Air Force contract cancellations have brought about a new agency to monitor upcoming USAF demand for power units. Its name: Air Force Aircraft Engines Logistics Planning Board.

The purpose, stated in Air Force Regulation 400-11, is to "provide guidance in the development of logistics plans which govern the determination of our requirements for spare engines."

Major factors in USAF's decision of last year that it had overestimated jet engine requirements were increased engine life and fuller utilization of air lift to cut down the number of units tied up in the pipeline.

These and other factors will be considered by the new Planning Board. To establish requirements, the group will use such data as:

- **Aircraft operational concept.**
- **Aircraft deployment.**
- **Pipeline factors.**
- **Engine life expectancy.**
- **Repair capabilities.**
- **Aircraft production rates.**
- **Methods of distribution.**
- **Attrition.**
- **Utilization in peace and war.**

The new regulation says that special emphasis will be given to spare engine pipelines, with a continuing study of in-transit times, stock levels, backlogs of reparable engines and overhaul times. Individual pipelines will be set up to meet the needs of special operations.

Formal meetings of the new board will be held twice a year. In addition, representatives of the Air Materiel Command and other agencies will be called when necessary.

Members of the board will come from:

- **Programs & Requirements** Division, Directorate of Supply & Services, AMC.
- **Transportation & Packaging** Division, Directorate of Supply & Services, AMC.
- **Directorate of Procurement** & Production, AMC.
- **Directorate of Maintenance** Engineering, AMC.
- **Directorate of Supply** & Services and Maintenance Engineering, Engine Prime Air Materiel Area.
- **Headquarters,** USAF.
- **Other major commands.**

## Dept. of Commerce Tightens Surplus Rule

Aircraft and aircraft components are included in a list of more than 50 "sensitive items" recently made subject to tightened control by the Department of Commerce when they are offered for domestic sale as surplus by U. S. Air Force.

New rules calling for special market impact studies have been imposed on top of existing regulations that require clearance from Commerce for sale of surplus property having an acquisition cost of $250,000 or more (AW May 16, p. 20 and June 20, p. 58).

Depending on condition of the goods, "sensitive items" with an acquisition cost down to $5,000 now must be brought to the attention of Commerce's Surplus Property Report Coordinating Office when they are put on the market.

The new USAF Regulation, No. 68-4, says Commerce has agreed to "make studies of surplus personal property scheduled for sale by military activities and evaluate the cumulative market impact of such offerings upon commodity inventories, process and employment situations."

Among the sensitive items listed are:

- **Aircraft, fixed wing,** complete.
- **Aircraft, rotary wing,** complete.
- **Airframe structural** component assemblies.
- **Aircraft propellers** and their components.
- **Aircraft landing gears** and components.
- **Aircraft wheel,** brake systems and components.
- **Aircraft hydraulic,** vacuum systems and components.
- **Nylon parachutes.**
- **Aircraft accessories** and their components.
- **Gasoline reciprocating** aircraft engines, component assemblies and spare parts (excluding hardware).
- **Operational training** devices.

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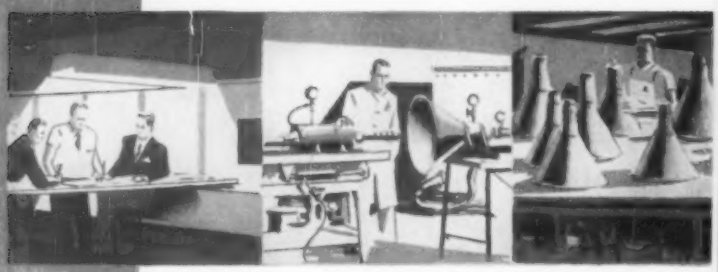

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# Lagging Public Construction — A Spreading National Blight

The most recent editorial in this series dealt with the plans of American industry for expanding and modernizing its plant and equipment over the next four years. These plans call for the expenditure of $113 billion over that period. There is a good prospect that the money to carry them out will be available. If the plans are carried out, manufacturing capacity at the end of 1958 will be double that which existed at the end of World War II. And this industrial plant will be modernized.

In sharp contrast to this picture is the condition of our *public* plant and equipment — the roads, schools, water supply, health and sanitation facilities upon which industry, as well as the average family, depends. **According to a recent estimate by the Twentieth Century Fund, the people of the United States must spend almost $100 billion on new public works projects during the next five years merely to meet the minimum needs of our growing economy.**

**Other estimates by the President's Council of Economic Advisers, by state agencies and by private construction economists all show the same condition: a staggering need for public works. Yet no steps have been taken that even offer a promise of closing the gap between the public facilities we are building and the greater facilities we really need.**

How did we come to let our public facilities fall into this sorry state? Here are some of the reasons:

(1) During the years of depression and war, from 1930 to 1945, these facilities were neglected. New construction declined, and even maintenance was cut.

(2) Since the end of World War II, increased construction costs have made it difficult for communities to get the needed construction with the funds budgeted in the past for that purpose.

(3) The great postwar upsurge in population, and the spreading of our population into new areas, has created a huge demand for additional community facilities before the neglect of earlier years could be made up.

## Responsibility Divided

Now the need for more public construction has become apparent to everyone, on jammed highways and in over-crowded schools. But, unfortunately, the responsibility for doing something about this situation cannot be so clearly fixed as can the responsibility for maintaining industrial facilities. A business firm must expand its capacity when markets are growing or lose its trade position. It must modernize its plant and equipment or be undersold by more efficient competitors. In the case of public facil-

ities, there is no such competitive incentive. To be sure, a city or state may lose population and industries if its public facilities are inadequate. But such shifts are very slow to take place and difficult to relate to any specific public program, or lack of it.

Moreover, the responsibility for constructing public facilities is divided between state and local governments and federal authorities. Within each of these governmental units there are specialized bureaus or departments with varying responsibilities. This division of responsibility obviously adds an element of difficulty to the development of an adequate program of public construction.

## Breaking the Log-Jam

How can this administrative log-jam be broken and the financial difficulties overcome?

One course would be to have the federal government step in with a nation-wide new program of direct spending on public works. That would utilize the resources of the federal treasury for immediate action. But there are weighty objections to such extensive federal participation. One is that federal spending cannot be greatly enlarged without a corresponding increase in the federal control of decisions that normally have been left to local communities. Another objection is based on the fact that so long as we must maintain a large defense establishment, such an addition to federal spending means either higher taxes or a chronically unbalanced budget.

The other course is to rely primarily on local initiative, but with new and more effective federal aid to local governments. Such aid would help speed up planning and construction, and contribute toward a solution of the most burdensome financing problems, but in amounts sufficiently limited to require that most of the capital be raised locally.

## No Single Formula

No one formula can be applied to make such aid effective. The raising of funds for new schools, for example, involves problems very different from those of financing highways, or water-works, or hospitals. But it does seem clear that, in all these fields, the federal grants must be designed to stimulate more local planning and financing than has prevailed in the past. Among the new ideas that may offer such incentives are federal grants for planning and initial costs and federal guarantees of local bond issues. Such aids have been remarkably effective in the fields of slum clearance and public housing.

While the federal government clearly has a role to play, we cannot afford to postpone inauguration of an adequate public construction program while we seek a formula to apportion governmental participation that would be generally accepted as ideal. Every year about 2½ million more Americans are putting increasing pressure on a public plant already dilapidated and inadequate. The result is an increasing menace to comfort, health, education and safety. It is also an increasing menace to the effective performance of American industry.

**The appropriate public response to this situation is a driving public determination to eliminate this increasingly dangerous lag in public construction. At this juncture, the development of such a determination is basic. Nothing stands in the way of an adequate program of public construction that a determined electorate cannot remove.**

*This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.*

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Donald C. McGraw

PRESIDENT

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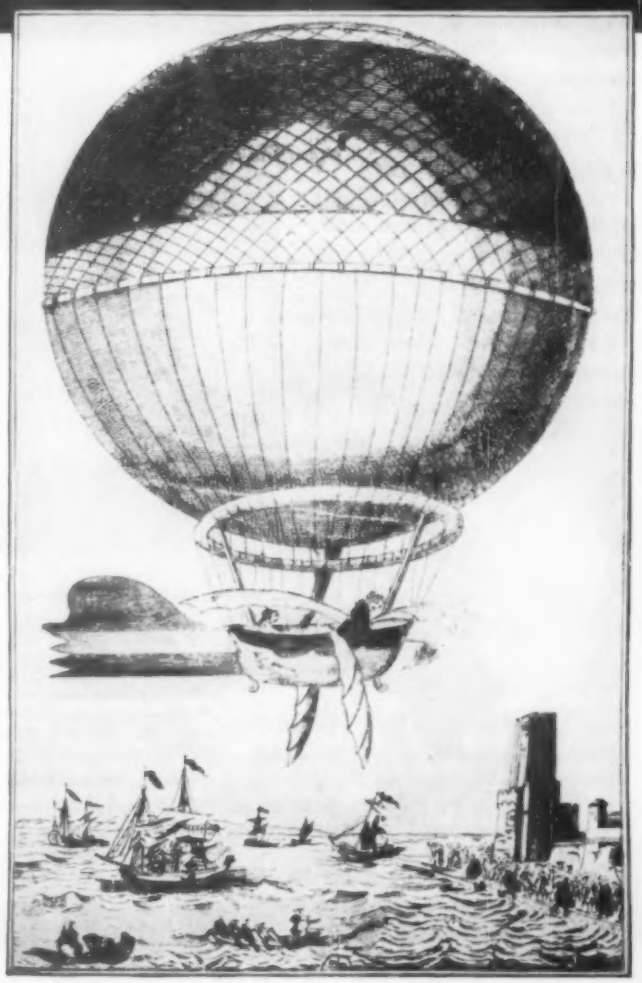
# *First Flight over the English Channel*

"The borderline of nations is crossed in the Air! . . . The seas are no longer barriers!" This was the exciting news on January 7, 1785, when Jean Pierre Blanchard, French aeronaut, and Dr. John Jeffries, American from Boston, made the daring and hazardous first air journey across the English Channel by balloon.

As the huge gas-filled sphere rose over the cliffs of Dover, sightseers crowded the coast, as well as boats off shore, to watch this first air venture over the sea. All went well until Blanchard and Jeffries were in sight of the French coast. With one quarter of the gas lost, they began to fall fast.

In short order they threw into the sea everything from sand ballast to apples and biscuits. "Still approaching the sea, we began to strip ourselves," Jeffries reported later. Not until even Blanchard's trousers went overboard did the balloon ascend. After two hours in the air Blanchard and Jeffries landed near Calais, where they received a royal ovation.

Less than two centuries later, aircraft span the globe. And ESSO research is part of that progress, helping to supply aircraft and engine builders, operators and pilots with the new and better aviation petroleum products they need.



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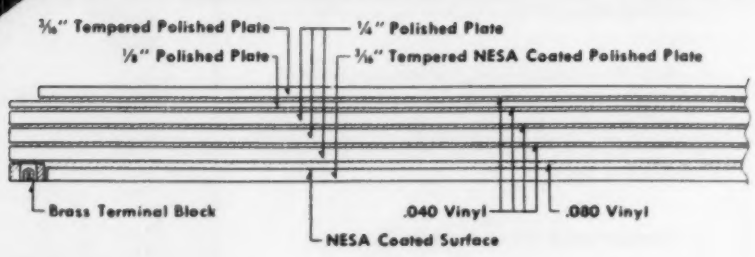


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# Indonesian Inquiry Indicates Bomb Downed Indian Connie

**New Delhi**—Positive evidence has been found by the Indonesian Inquiry Commission that a time bomb caused the crash of the Air India International Constellation Apr. 11, in which a number of Chinese Communist officials were killed while en route to the Asian-African Conference.

This is stated in the report of the Commission, which investigated the crash of Air India's "Kashmir Princess" off the Great Natuna Islands in the South China Sea.

Official summary of the report follows:

- The aircraft was airworthy and properly certified.
- The crew was experienced and held valid licenses.
- The aircraft was properly loaded and had sufficient fuel for the flight.
- The takeoff from Hongkong was normal and the flight uneventful for the first five hours.
- An explosion occured on board the aircraft when cruising at 18,000 ft. over the sea. A fire broke out in the starboard wing and spread rapidly, causing failure of the hydraulic and electrical services.
- A rapid descent for ditching was immediately commenced and the emergency procedures were carried out efficiently and calmly by the crew members under extremely difficult conditions.
- The aircraft hit the water with the starboard wing tip while under partial loss of control and broke up on impact.

Salvage operations to recover the wreckage from the sea were commenced on Apr. 25 and lasted 14 days during which period up to 90% of the wreckage was recovered. An inspection of the wreckage revealed confirmatory evidence of a fire having started in the area referred to by the surviving members of the crew.

There was positive indication of an explosion believed to have occured in the wheel-well of the starboard undercarriage. The evidence consisted of:

- Bulging outward of skin and strut members in the immediate area.
- Deep pitting of shrapnel in skin and structural members facing the explosion.
- A hole blown inward into No. 3 fuel tank.

An inspection of the wreckage reveals positive evidence of an explosion in the starboard wheel-well of a timed "infernal machine," parts of which are still trapped in the wreckage.

The recovery of four parts of a twisted, burnt and corroded clockwork mechanism, which has no relation to any equipment or structure of the aircraft, provides irrefutable evidence of an infernal machine having been placed in this area.

The explosion is believed to have resulted in the puncturing of No. 3 fuel tank and in uncontrollable fire.

Evidence of the survivors states:

"A muffled explosion was heard on board. Smoke started entering the cabin through the cold air ducts and a localized fire was detected soon after on the starboard wing behind No. 3 engine. A rapid descent was commenced for ditching the aircraft and distress signals broadcast. In spite of fire fighting action during which No. 3 engine was feathered, the fire spread rapidly and caused hydraulic failure followed by electric failure. During the final stages of the descent, dense smoke entered the cockpit reducing visibility to almost nil."

## Douglas Concentrates On VTOL Transport

Douglas Aircraft Co. engineers have rejected the helicopter as a short range commercial transport possibility and are concentrating their efforts on a fixed-wing design capable of "variable take-off."

While the aircraft could rise like a helicopter with minimum load, it also could increase payload and range by making a ground run of limited length. Douglas is the first major transport manufacturer to express interest in a VTOL transport similar in performance to the model already test-flown by the National Advisory Committee for Aeronautics (AW June 13, p. 30).

In a speech before the American Helicopter Society at Hampton Roads, Va., James B. Edwards, assistant to the chief engineer at Douglas, said the company has no plans to build the "variable take-off" plane in the immediate future. Main Douglas effort now is devoted to military aircraft and long range transports.

Edwards said his company is eager to find a replacement for the DC-3 but has found no answer in conventional fixed-wing designs.

## Harmon Winners

**J. F. "Skeets" Coleman, Convair test pilot, and Capt. Marion H. Eppes, USN, have been chosen winners of the 1955 Harmon International Aviation Awards.**

**Coleman was honored for his flights in the Navy XFY-1 VTO fighter, "more than 60 free vertical take-offs and, ultimately, to level flight and back down to a vertical tail-sitting."**

**Capt. Eppes was cited "for extraordinary achievement as commander of the Goodyear Navy airship ZPG-2 . . . from 17 to 25 May 1954, during which his airship remained aloft for more than eight days and cruised in excess of 3,000 mi., thereby breaking all world records for self-sustained, non-refueling flight of any type aircraft."**

**There was no Harmon Award for an aviatrix this year.**

## New York-Louisville Nonstop Investigated

An investigation of proposed nonstop service between New York and Louisville, Ky., has been instituted by Civil Aeronautics Board.

The CAB action came after a court order held up the Eastern Route Consolidation Case in which the nonstop service was an issue. Delta Air Lines has requested judicial review of the

## Britannia Transport for Israel

**El Al, Israel's national airline, has announced its order for three Bristol Britannia 300LRs, with an option for two more, confirming an Aviation Week report (Mar. 28, p. 85). El Al expects to have its turboprop Britannias operating by early 1957. Interior layout will accommodate 93 passengers in two compartments—first class, including sleepers, and tourist class. The planes will be capable of nonstop service across the Atlantic in both directions. Payload over 4,600 mi. Still air range is given as 28,000 lb. Cruising speed is 385 mph. Four Proteus 755 engines produce 4,120 eshp. each. El Al, which has used American equipment until now (Constellations, C-46s), is the first non-British carrier to order Britannia. BOAC ordered 33, including 10 of the 300LR version, and the British government ordered three 250LR freight-and-passenger transports.**

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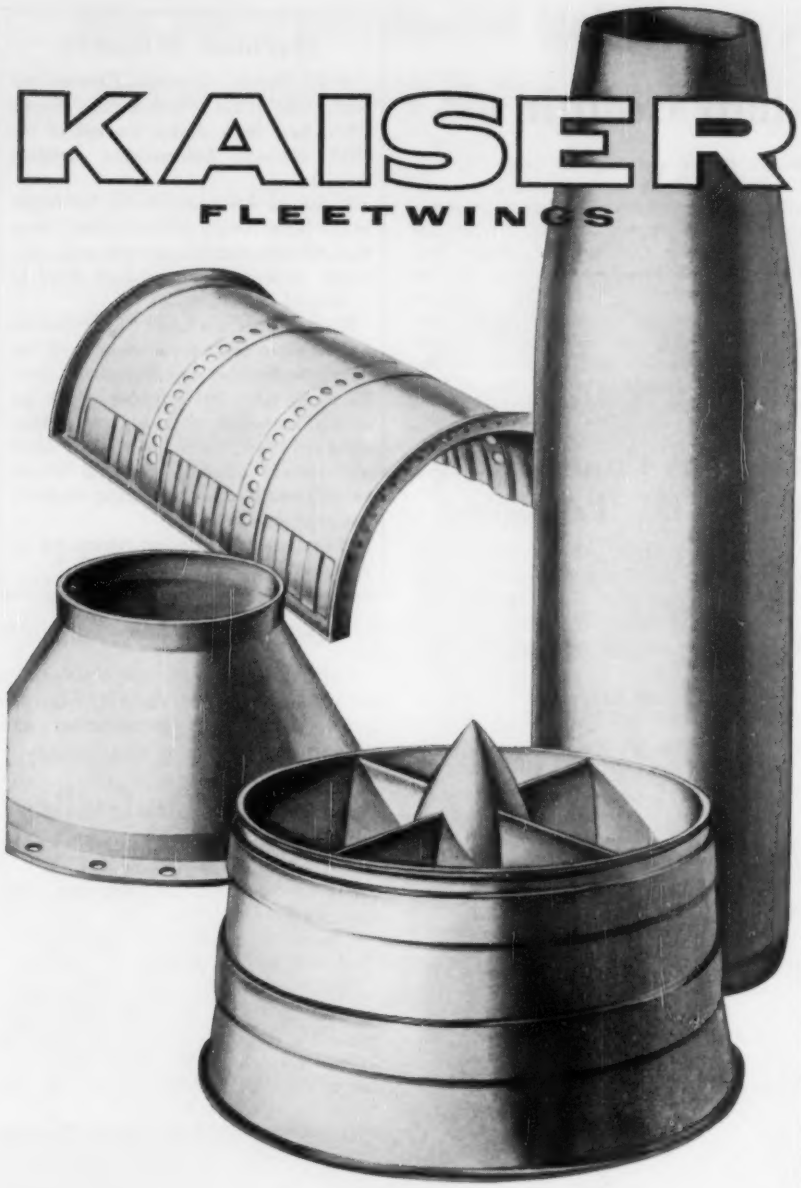

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Board's consolidation order in the eastern case, and it will be held up until the court disposes of the Delta motion for stay.

Meanwhile, CAB wants to go ahead with the Louisville-New York nonstop investigation, so it has severed nonstop applications of American Airlines, Trans World Airlines, Eastern Air Lines and the Commonwealth of Kentucky and consolidated them into the Louisville-New York direct nonstop air service investigation.

## $72.7 Million Budget Approved for NACA

Congress decided on a $72.7 million Fiscal 1956 appropriation for National Advisory Committee for Aeronautics—$3.8 million less than NACA's request.

The amount approved, though, is $16.8 million more than NACA's Fiscal 1955 budget.

The Senate approved NACA's full request of $76.5 million, after a plea from NACA's chairman, Dr. Jerome Hunsaker, that "by retarding scientific research at this time, we are risking early obsolescence of the nation's air forces."

The House had previously reduced the budget by $8.8 million.

The $72.7 million voted NACA includes $60.1 million for operations and $12.6 million for new construction projects (AW June 13, p. 18).

The operational money will provide for some acceleration in research, although not as much as proposed by NACA, and operation of three new wind tunnels which will come into operation shortly. The construction money includes over $4 million for a nuclear research facility.

## New Accident Report

A revised and redesigned aircraft accident report form CAB-454 has been approved by Civil Aeronautics Board. The new form will be used to report all accidents to civil aircraft with a maximum gross take-off weight in excess of 12,500 lb.; helicopters and all Alaskan air carrier aircraft regardless of weight. CAB has ordered use of the new report form beginning July 1.

CAB said redesign of CAB-454 was for purpose of obtaining additional and more detailed information to develop analytical and statistical data.

## Correction

Vickers Supermarine Swift fighter did not "break up in the air" as reported in AVIATION WEEK Mar. 14, p. 332. The three crashes of the Swifts resulted from causes other than structural failure in the air.

# Engineering Design

# Research Development

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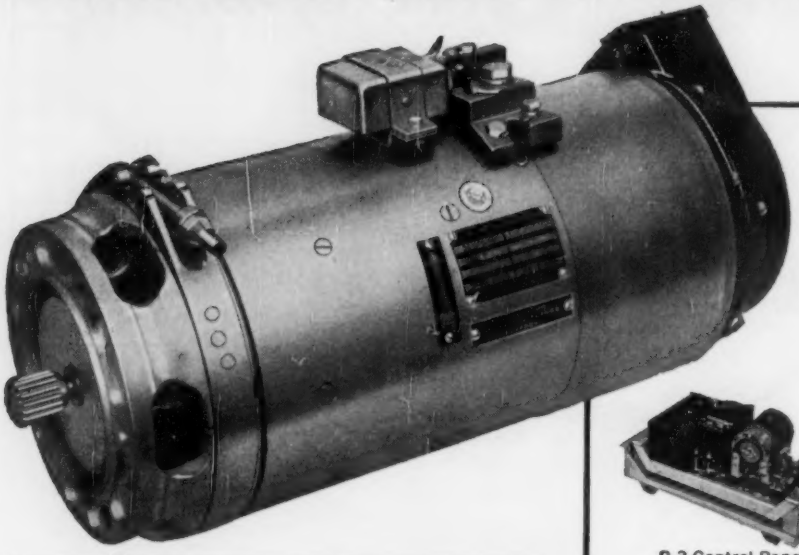
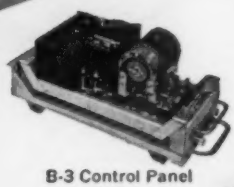
*Antenna Design*
*Miniaturization*

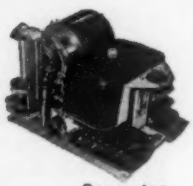
# Bendix Red Bank OFFERS A COMPLETE LINE OF DC GENERATORS



## PLUS THIS PROTECTIVE AND CONTROL EQUIPMENT FOR DC SYSTEMS

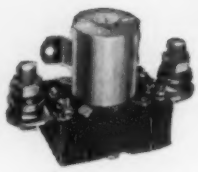


B-3 Control Panel

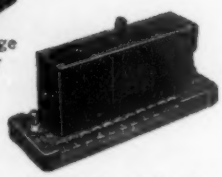


Generator Control Panel

Overvoltage Protector

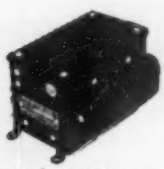


Line Relay



Feeder Circuit Breaker

Voltage Regulator



Fault Detector Panel

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| Type No. | Nominal Rating | | | Approx. Weight Lbs. | Designed to Gov't Spec. |
|---|---|---|---|---|---|
| | Amps. | Speed Range RPM | Altitude Ft | | |
| 30E01 | 50 | 2200-4500 | 20,000 | 24 | M-2, M-3 |
| 1345 | 50 | 4000-8500 | 30,000 | 14.25 | |
| 30E22 | 50 | 4000-8500 | 30,000 | 16.25 | |
| 30E14 | 75 | 4000-8000 | 25,000 | 24.5 | N75-2RA |
| 30E16 | 100 | 2500-4500 | 50,000 | 40 | 52B6588 |
| 30E20 | 150 | 4000-8000 | 65,000 | 45 | |
| 30E17 | 200 | 2870-8600 | Ground Power | 40 | |
| 30E07 | 200 | 3000-8000 | 50,000 | 45 | AN-3632 |
| 30E18 | 200 | 4000-8000 | 50,000 | 38 | MS-25009 |
| 30E19 | 250-350 | 1600-7500 | Ground Power | 98 | |
| 30E02 | 300 | 3450-8500 | 25,000 | 64 | |
| 30E15 | 300 | 4000-8000 | 50,000 | 50 | AN-3623 |
| 30E05 | 400 | 3000-8000 | 50,000 | 68 | AN-3634 |
| 30E10 | 400 | 3100-8000 | 60,000 | 67 | AN-3624 |
| 30E11 | 500 | 4000-8000 | 50,000 | 75 | |
| 30E13 | 500 | 3500-8000 | 50.000 | 86 | |

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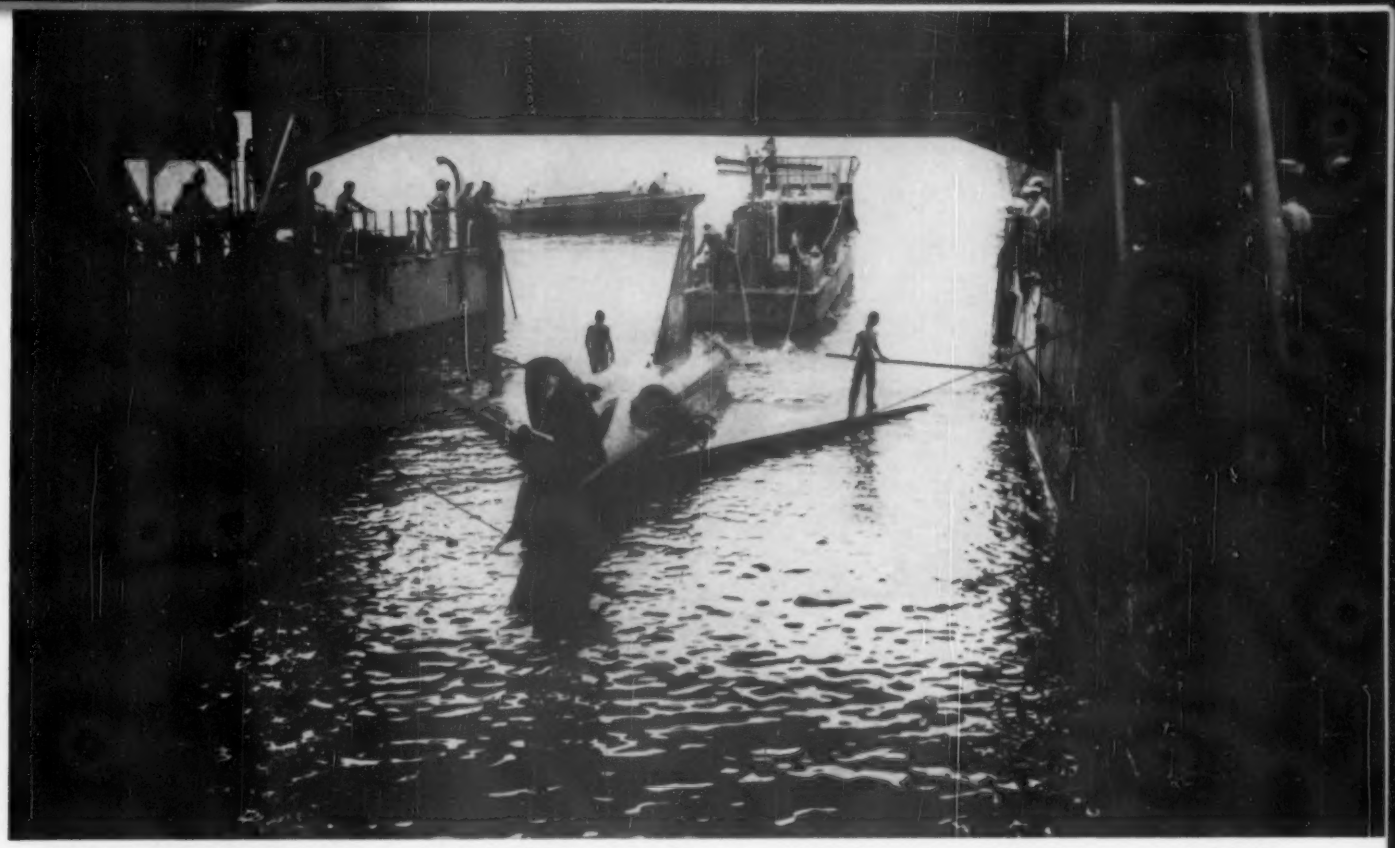


**FLOATING INTO FLOODED HOLD** of a 400-ft. Landing Ship-Dock, Convair is guided by lines and poles. After LSD ramp is raised, hold will be pumped out and plane dry-docked.

# Convair F2Y Tests its Sea Legs

Helicopters, hundreds of men and dozens of boats tied together by a complex radar and radio communications network, monitor every test of Convair's twinjet F2Y-1 Sea Dart, hydro-ski flying boat fighter.

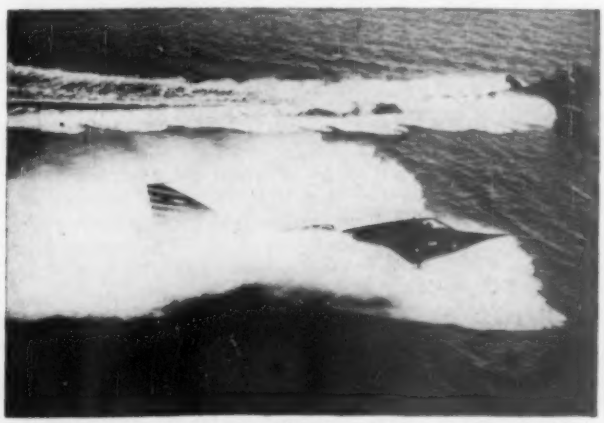
There is a specially-equipped boat fitted with starting gear should the F2Y's Westinghouse J46 turbojets quit while it is in the water. A 400-ft. LSD has been used as a "mother ship" to dry-dock the plane during its sea trials.

Recently a Navy team from Patuxent NAS, Md., made a research and development study of the fighter at San Diego. Their report is expected in the next few weeks (AW July 4, p. 9).

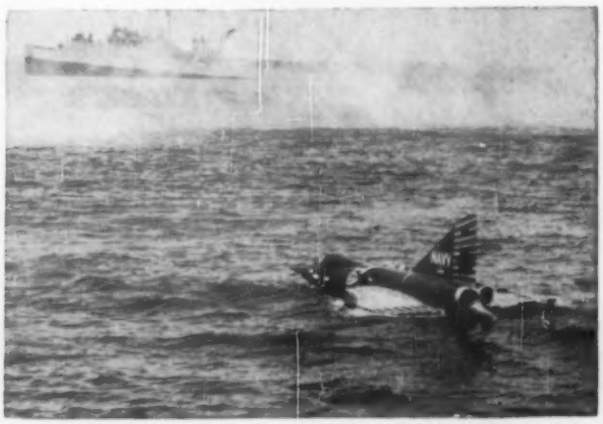
Two versions of the airplane are under test; the one pictured with dual hydro-skis and a sister plane with a single hydro-ski.

Performance tests have recently shown the F2Y is supersonic in a shallow dive.

**FROGMEN** on F2Y's wings await launching.

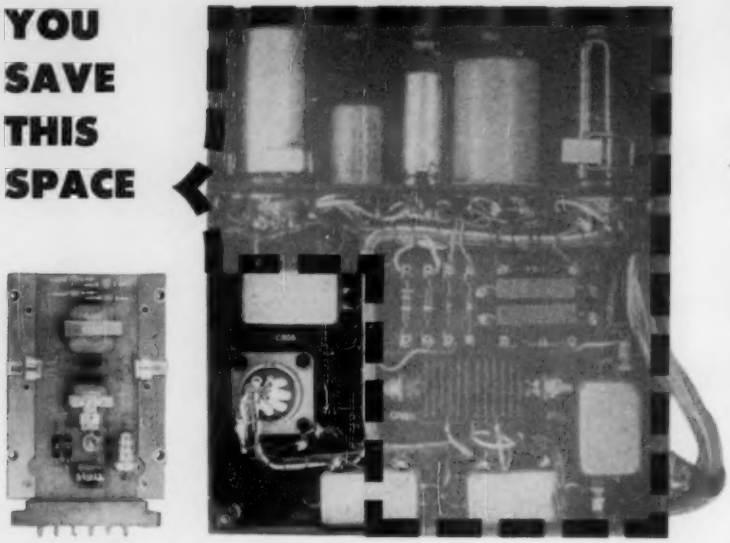


**FAST BOAT,** with frogmen aboard, monitors Sea Dart takeoff.



**NAVY CRANE** (background) stands by during Sea Dart test.

YOU SAVE THIS SPACE



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## Modification of CAR Proposed for Turbines

Modification of Civil Air Regulations applying to turbine-powered airplanes has been proposed by the Bureau of Safety Regulation of the Civil Aeronautics Board.

The draft proposal would amend sections on engine rotation and instrumentation requirements in domestic, international and irregular CARs to modify their application to turbine engine installations.

Current CARs require airplanes to have means for stopping engine rotation in flight. The amendment would require means for stopping turbine engine rotation in flight only if the Civil Aeronautics Administrator finds such rotation could jeopardize the safety of the airplane.

In view of the limited experience of air carriers with turbine engines, a second amendment would give the administrator authority to permit or require instruments for turbine-powered aircraft which would provide safety equivalent with present requirements.

## PanAm Protests CAB Mail Pay Reductions

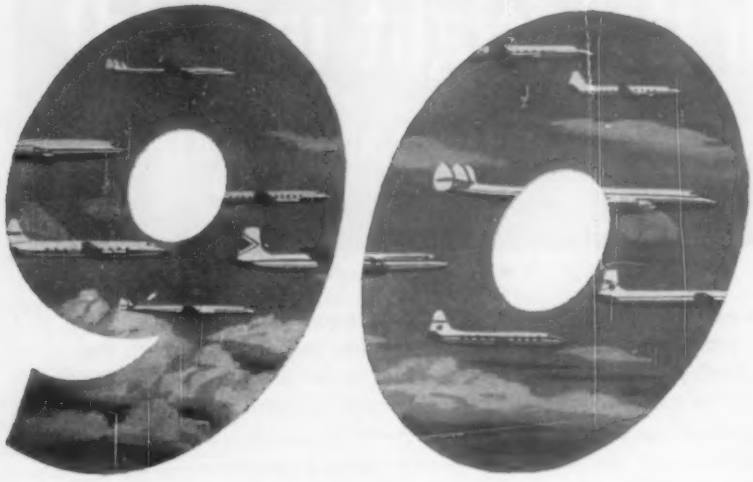
Pan American World Airways has protested the proposal of the Civil Aeronautics Board to make drastic cuts in mail pay for PAA trans-Pacific and Latin American operation (AW June 13, p. 132).

The international carrier says that mail pay proposed by CAB fails to provide a return on an investment of $48,000,000 in Latin American operations and $29,000,000 in Pacific operations, plus another $20,000,000 in the Pacific when equipment now on order is delivered.

The Board based its reductions in mail pay on its policy of providing only for breakeven need in setting temporary rates. Pan American says that CAB has not followed that policy in reducing rates in the past and has failed to recognize the need of a carrier for a return on investment in maintaining its financial standing.

In Pacific operations, the Board put Pan American on a service rate, estimating that increased volumes of military mail would provide more than the breakeven need. The carrier says that distribution of the mail traffic has shifted in favor of Northwest Airlines because of that carrier's superior route pattern. Pan American predicts that Northwest will get substantially all of the military mail traffic when it is able to replace its DC-4s with modern equipment.

# *Simmonds Fuel Gage Systems Measure and Manage Fuel on*

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Chief Engineer, El Segundo Division
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—E. H. HEINEMANN

*at SAE National Aeronautic Meeting, Los Angeles*

This growth factor discussed by Mr. Heinemann makes excess weight costly indeed. At $500 per pound, it literally costs its weight in gold. (Gold at $35 per troy ounce is worth $510.30 per avoirdupois pound.)

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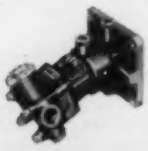

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

# Leduc 0.21 Puts Ramjet in Spotlight

By David A. Anderton

**The exciting performance of Rene Leduc's 0.21 interceptor at the Paris Salon de l'Aeronautique focused technical attention again on the potential of the ramjet powerplant.**

**Leduc's experimental craft—only man-carrying pure ramjet-powered airplane to fly or now flying—was demonstrated by test pilot M. Littolff in a manner that left no doubt of his confidence in the unusual engine (AW June 27, 1955, p. 17).**

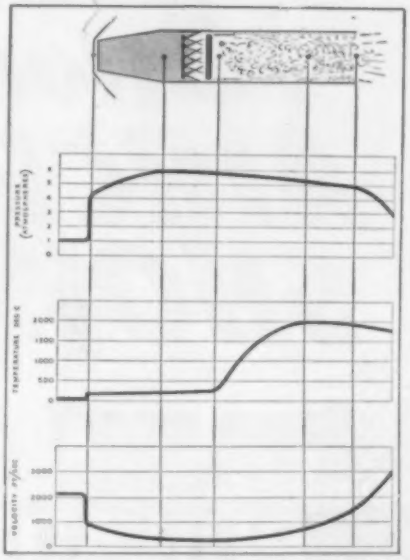
Next step in the development of this series is the 0.22, a sweptwing interceptor powered by a single Snecma Atar turbojet in the center of the hollow fuselage, surrounded by the concentric rings of ramjet burners.

For Leduc, this will be a high point in an almost single-handed effort to make the ramjet a practical airplane powerplant instead of a scientific curiosity. Because in spite of the extensive experience of many other firms—a leading example is Marquardt Aircraft Co. (AW Apr. 18, p. 43)—ramjets have found no other application outside of the limited range of guided missiles.

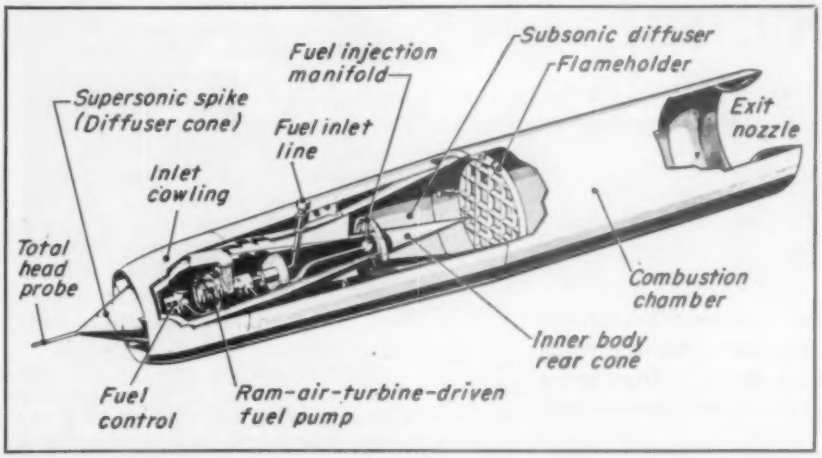
Paradoxically, the ramjet is one of the oldest powerplants known to aircraft engineers; through the years it has been the hardy perennial of powerplants, born and reborn since some years before the first World War.

Today it offers a lightweight engine of enormous thrust, capable of a speed range (depending on design) from the low subsonic to Mach 4. It can operate from sea level to altitudes as high as 100,000 ft. Its thrust-weight ratio is a great improvement of over that of typical high-ratio turbojets.

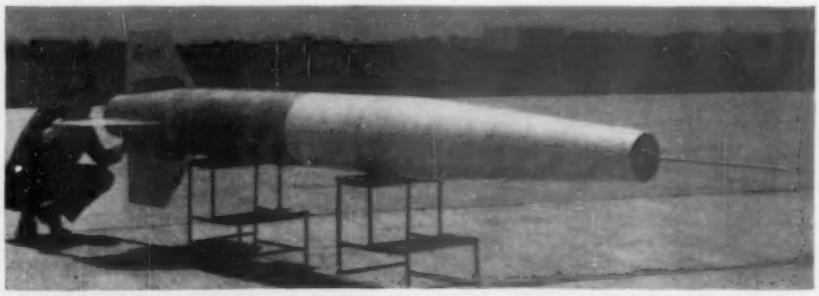
But these advantages do not come free; the great disadvantage of a ramjet is that it must be accelerated to a moderate subsonic speed before the fire can be lit. This single drawback spells operational difficulties of a large scale.



**TYPICAL** ramjet parameters at low Mach.




**RAMJET SCHEMATIC** is indicative of layout and typical design for moderate supersonic Mach numbers. Engine is similar to those now in development at Marquardt and Wright.



**NACA RAMJET** test vehicle was used in early drop tests to verify performance theory for these engines. Simple pitot inlet shows best efficiencies at low supersonic speeds.

The ramjet cycle is a simple one to describe. Air at high speed is admitted through an inlet, compressed by ram pressure of the air upstream of it, diffused to a higher pressure and lower velocity, mixed with fuel, burned and exhausted through a suitable nozzle.

A ramjet has three components: a diffuser, combustion chamber, nozzle.

The complete lack of a mechanical compressor or of any motion—rotating or reciprocating—make the engine a most attractive proposition. It is the closest approach to a pure aerodynamic powerplant yet developed.

Earliest references to the engine include a description by a Frenchman, Rene Lorin, who stated its basic principles back in 1913. His name has often been given to the engine by French and Germans who refer to the powerplant as a Lorin-engine.

Leduc's work began in 1933, when he proposed an airplane layout much like the 0.21. A model of this design was shown in the 1938 Paris show.

But it took World War II to give the unusual powerplant some impetus. German scientists, intrigued by the simplicity of the engine and seeing its obvious applications to missiles and fighters, started a long series of experimental applications, tests and studies.

Five prominent German engineers—Pabst, Saenger, Lippisch, Oswatitsch and Walter—worked on the ramjet.

Two major contributions came from their work: a subsonic ramjet designed by Pabst for a Focke-Wulf fighter proposal, and a supersonic diffuser design

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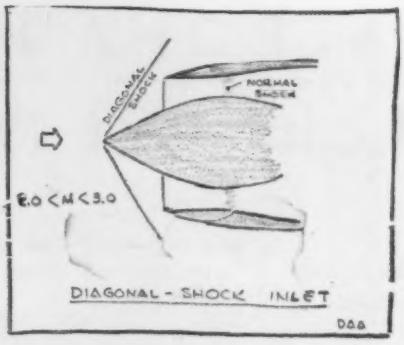


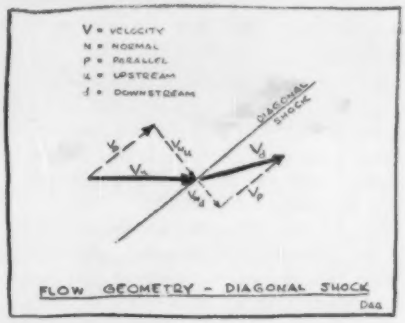


of high efficiency proposed by Oswatitsch. This latter work has been one basis for many ramjet powerplants.

### Efficient Ramming

The goal of the engine designer is to get as high a pressure ratio as possible in the most efficient manner. In ramjets, the designer wants to get a stagnation pressure (total pressure at zero with the air brought to rest) measured in many multiples of the free-stream pressure.

The theoretical ideal is when the compression is shock-free and reversible adiabatic (no heat added or lost). At Mach 2, the theoretical pressure ratio is about 10, comparable to the best turbojets; at Mach 3, about 35, and at Mach 4, almost 150 times free-stream pressure. These are ideal values; the problem is to approach them in practice.

There is another problem inherent in the basic concept of the ramjet: The fuel-air mixture will not stay lit if the airspeed in the combustion chamber is too high. The designer must first create a dead area to hold the flame in a velocity region where the airstream speed is below the flame propagation speed of the mix. For hydrocarbon fuels, this is only a few feet per second.

Then he must assure that the air passing by this dead area is traveling slow enough to allow the burning to spread beyond the dead area but not fast enough to blow it out of the area.

In practice, both high pressure ratios and low combustion-chamber speeds are achieved by efficient diffusion of the airstream. Consequently, the diffuser of the ramjet is its most important single component. It follows that most

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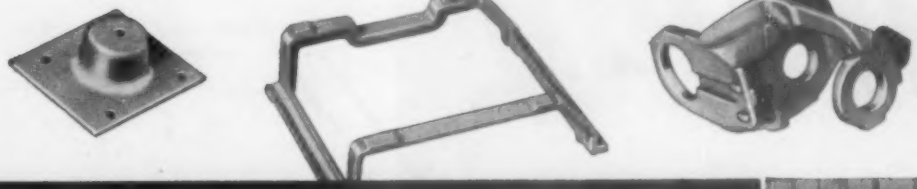

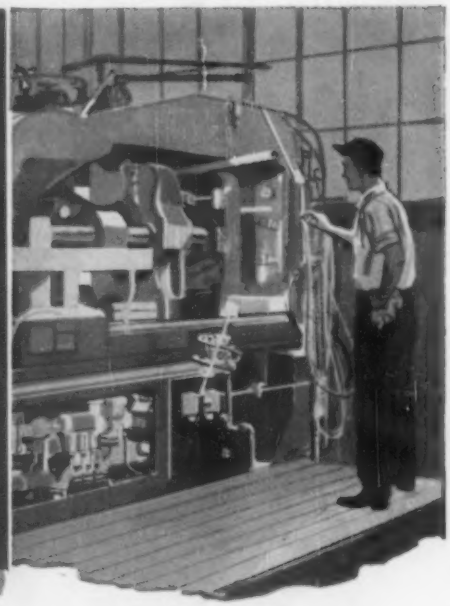

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*Check-Chart Shows Versatility of Bendix Foundries*

| PROCESS USED | METAL WORKED | |
|---|---|---|
| | ALUMINUM | MAGNESIUM |
| Sand | √ | √ |
| Plaster | √ | √ |
| Shell Mold | √ | √ |
| Die | √ | √ |
| Permanent Mold | √ | √ |

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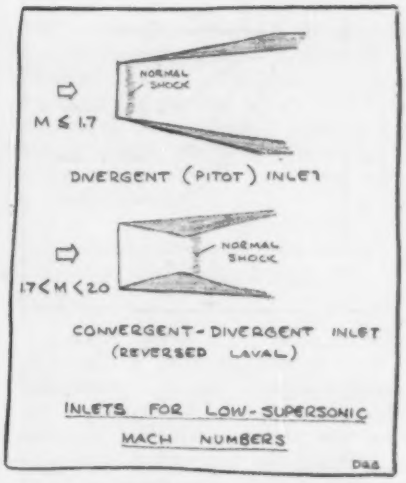


of the work done in ramjet development has been in diffuser design.

### Diffuser Principles

Subsonic diffuser design is well-established and conventional; the area of the duct is increased slowly, generally so that the equivalent circular areas generate a cone of less than seven degrees vertex angle. The air passing through the duct converts some of its speed to pressure.

A practical goal for inlet velocity to the combustion chamber is between 200 and 400 fps. Lower values requires too long a diffuser; higher values mean flame blowout, perhaps no flame-holding.

A supersonic diffuser is a different problem because of the shock wave upstream of the inlet. Air must first be decelerated through the shock before it can enter the internal diffuser toward the combustion chamber.

The designer knows that the flow velocity across a normal shock (normal here means perpendicular to the free-stream flow) is reduced from supersonic to subsonic. He also knows that reduction in velocity means a loss of recoverable pressure, increasing as the upstream Mach number increases.

These two fundamentals of flow restrict supersonic diffuser design, and virtually dictate the type of diffuser to use for each Mach number range.

Specific types of diffusers can be "rated" and therefore limited to specific applications, by comparing their actual pressure ratios with theoretical ideals.

### Specific Designs

The simplest diffuser for supersonic flow is a divergent duct with a single normal shock at the inlet. This is sometimes called the "pitot" type. It has been used in early ramjet test vehicles on the Bumblee contract.

It furnishes rather low pressure recoveries, and for that reason is generally limited to design applications where the

**Nothing Less than this ALL-ANGL Mount gives sure protection in JETS and MISSILES**

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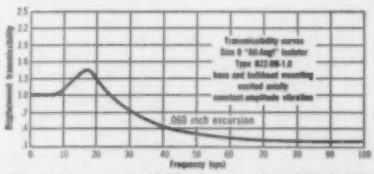


**Typical transmissibility curve for ALL-ANGL mount, both base and bulkhead mounting, excited axially at constant amplitude.**

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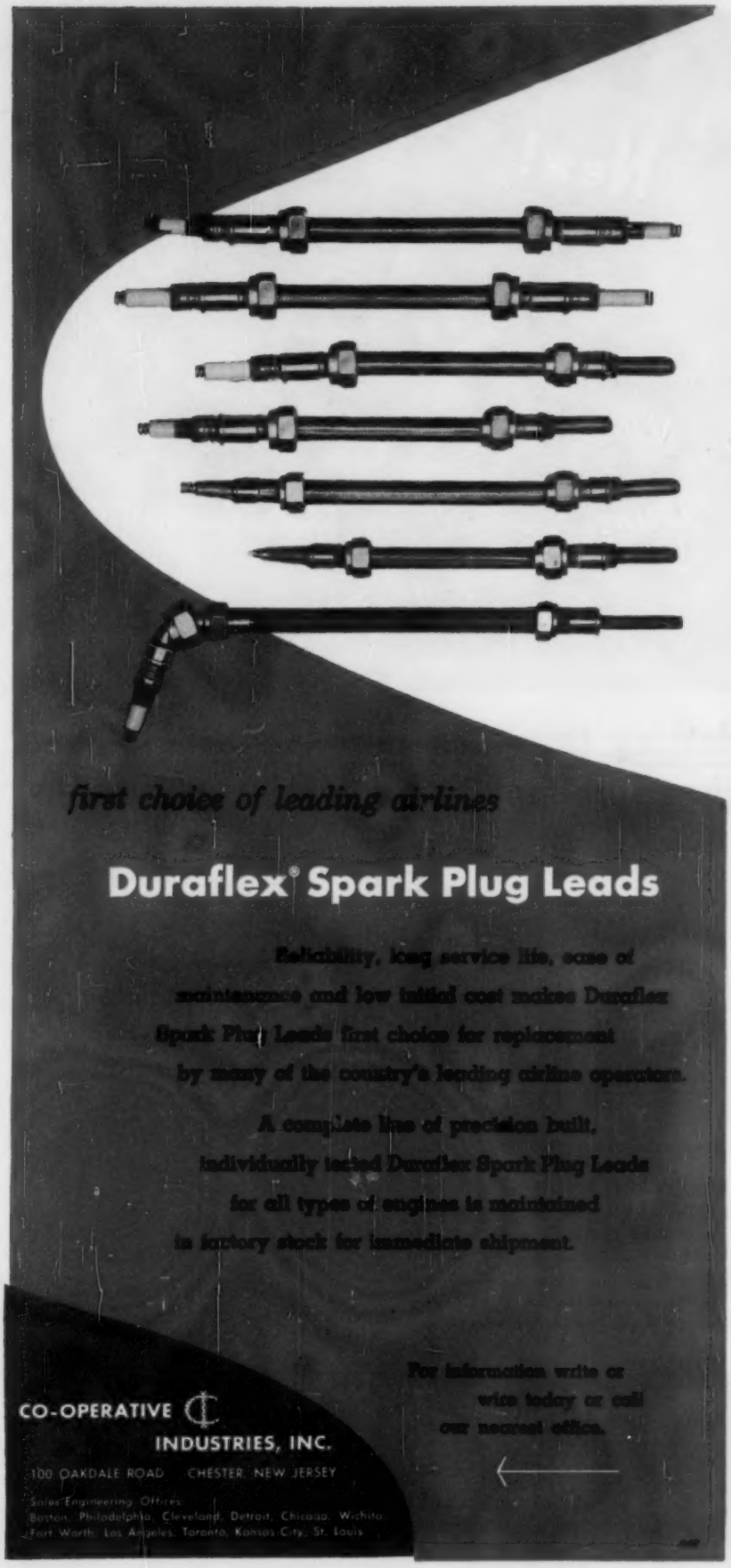
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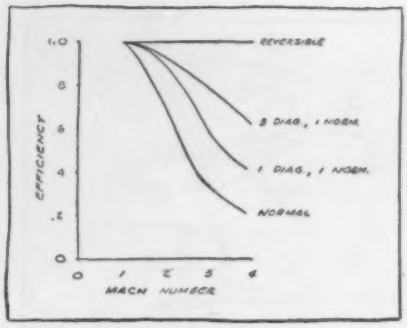



speed is going to be below Mach 1.7.

Next in complication is the convergent-divergent entry, sometimes called the reversed Laval nozzle. This inlet first contracts—which is a means of reducing the approach flow speed—and then expands. The transition point is a minimum-area throat, where a shock wave forms and stabilizes. Flow upstream of the shock is supersonic, downstream is subsonic. By reducing the approach Mach number, this type of inlet reduces the pressure loss across the shock.

There is one tricky aspect of this design: The shock must stay at the throat. If there is too much back pressure (perhaps a momentary surge in the combustion) the shock can be forced out, or regurgitated from the throat. A reduction in back pressure can permit the shock to be swallowed again.

This sensitivity to back pressure is characteristic of most simple diffusers and rather restricts their operational speed range and increases the amount of control precision required.

Mach numbers between 1.7 and 2.0 are the best operating range for the reversed Laval inlet.

### Decreasing Losses

As the free-stream Mach number increases, so do the losses. There is only one way to stop the inexorable trend toward decreased efficiency, and that is to change from a normal shock pattern to a diagonal one. A little geometry shows why.

Velocity components across the diagonal shock can be broken into two components, one parallel and one normal to the shock. The normal component is obviously less than the free-stream velocity, so the loss due to the shock is less than if the normal velocity were the full value. The parallel component does not change, and, combined on the downstream side with the subsonic normal component of velocity, results in a turned flow.

The practical value of all this is to produce a diffuser efficiency of about 81% at Mach 2.5 instead of the 50% obtained with a single normal-shock inlet of the pitot type.

The design of an inlet to accomplish

this job is simple. A central pointed body is used to generate the diagonal shock; the flow is taken in through an annular cowling. The normal shock forms at the cowling lip to reduce the flow from the supersonic value behind the diagonal shock to the subsonic value associated with the jump across a normal shock.

The reasoning that produces the single-shock inlet—sometimes called the Ferri type after Antonio Ferri, who developed the concept—can be extended to produce multiple-shock inlets. If one diagonal shock is good, this reasoning goes, two is better and three is even better. Ostwatitsch in Germany did the first work on two- and three-shock inlets.

As the number of diagonal shocks increases, the efficiency curve gets closer to ideal value. In each case, though, there must be a final normal shock to reduce the flow to subsonic speed.

There is a drawback to this technique: the flow is turned each time further from the centerline of the engine. This means increased diameter and therefore drag in an engine where drag is to be minimized.

There is an aerodynamic trick that can be applied to eliminate the size increase. The flow can be turned alternately away and toward the engine centerline by reflecting the diagonal shocks downstream in a properly shaped channel. The oncoming air still goes through a number of diagonal shocks to reduce its speed, but the diameter of the engine stays within reasonable values.

The final step in the development of the multi-shock diffuser is to assume an infinite number of shocks to slow down and turn the flow. This leads to a curved nose profile on the center body, with a shock wave clinging to the contour, impinging on the cowl lip, reflected down the channel and finally going subsonic through a normal shock.

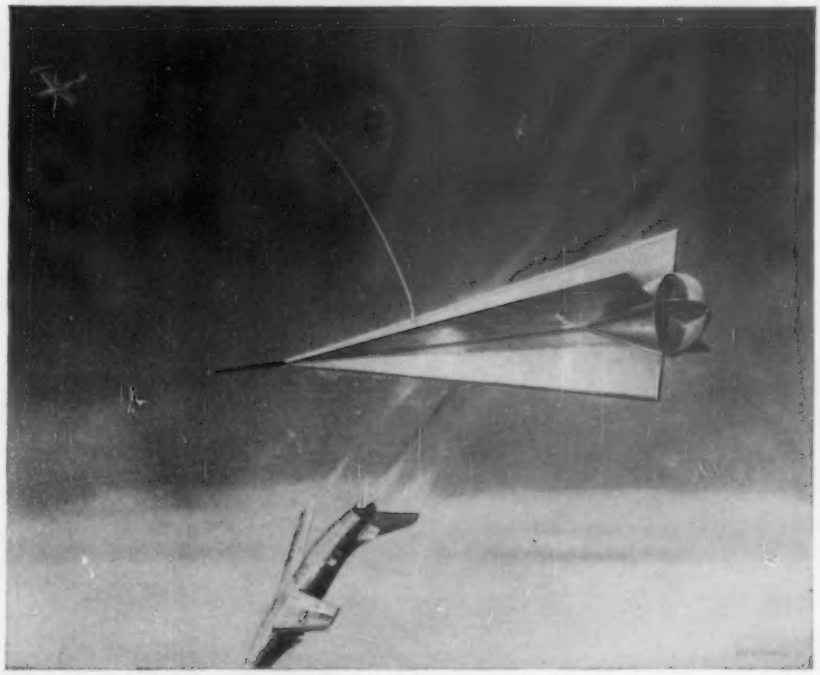
Recoveries obtained by this kind of a diffuser are several times those obtained with less sophisticated configurations at high Mach numbers. One well-designed inlet showed a design efficiency of three times normal shock efficiency at Mach 4.0.

Actual test results do not match theoretical maxima. One of the reasons for this comes from boundary-layer effects. During the compression of the air outside the diffuser inlet and its subsequent passage down the reflecting channel, the boundary layer builds up. There is a complicated interaction between the shock wave and the boundary-layer that tends to cause losses reduce the diffuser efficiency.

Another possible source of loss in actual applications comes from the sensitivity of these highspeed inlets to angle of attack. A slight amount of angularity is permissable—perhaps four or five degrees—but over this value the pressure recovery falls off rapidly.

The air at high pressure and moderate velocity enters the ramjet combustion chamber. Current techniques call for fuel to be injected at the end of diffusion, followed by mixing of the air and fuel in the combustion chamber. Downstream is a flameholder—generally concentric rings of high drag—which actually do what their name implies; they hold the flame at that station in the combustion chamber.

Ignition is done at the center of the flameholder.



# Honeycomb Tow Target in Use

A production version of an aerial target, built for towing at jet aircraft speeds, has been developed by Honeycomb Structures Co., Inc., Los Angeles.

Known as Towdart, the target is a refinement of the dart-shaped unit originally developed in plywood at Naval Ordnance Test Station, Inyokern, Calif. (AW Dec. 6, 1954, p. 37).

Reported in use at the Inyokern facility and by North American Aviation, Towdart is constructed of aluminum alloy skins enclosing paper honeycomb. This makeup is said to lessen flutter characteristics of the target, hence permits it to be towed at faster speeds than its plywood counterpart.

The four airfoils forming the dart are connected at the centerline area by means of a slotted cruciform extrusion.

The airfoils themselves provide side radar reflectivity, while the end installation gives adequate reflectivity fore and aft.

The snatch pickup technique has proven satisfactory. Using a 4,000-ft. nylon towline, the target follows well below the towing aircraft in flight.

Three sizes of the target are available —lengths of 12, 16 or 20 ft., with respective spans of 4, 6 and 8 ft. Length does not include probe, which is adjustable to balance the target.

# Survey Ties R & D Cut To Scientist Shortage

Industrial firms conducting a major part of the nation's research and development are cutting back their plans for increased R&D programs because of a serious lack of trained scientists.

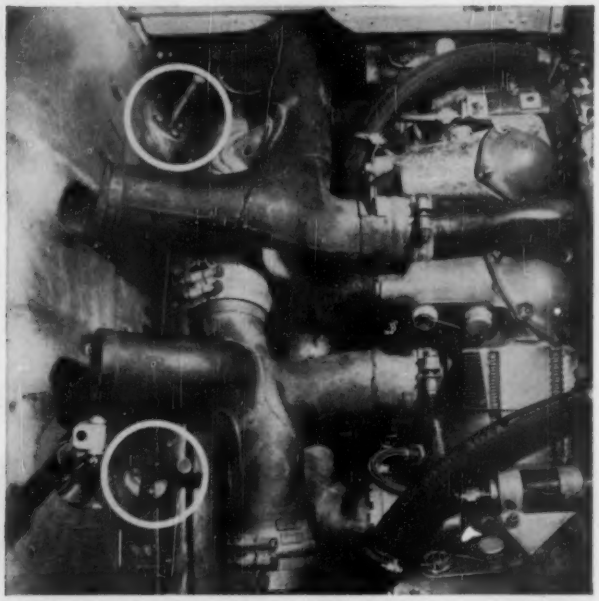
Although many scientists and engineers state that the shortage is apparent only, and due to misapplication of manpower, preliminary findings of a study of industrial research being made by the Bureau of Labor Statistics as part of the National Science Foundation's national survey of scientific R&D, indicate that to employers the shortage is very real.

The survey shows that at least half of 200 large companies—all of them in essential industries, and all engaged in substantial research and development programs—report a shortage of trained manpower. To more than two-thirds of these, the shortage is major.

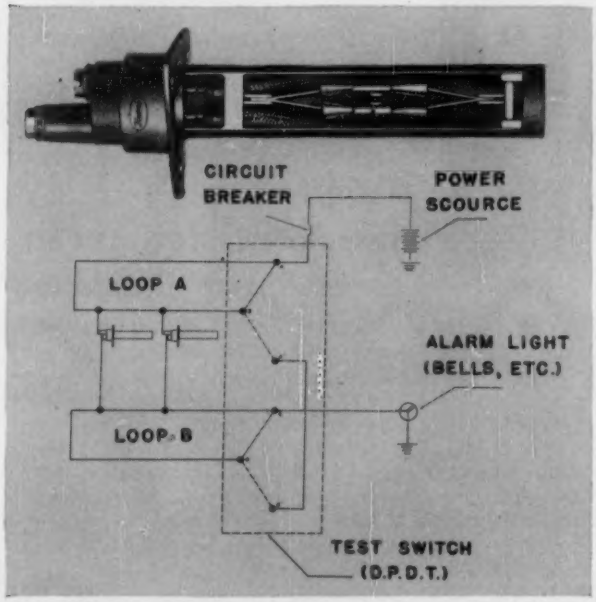
To get a clearer picture of the situa-

# Why intercontinental and transcontinental aircraft depend on Fenwal unit detectors

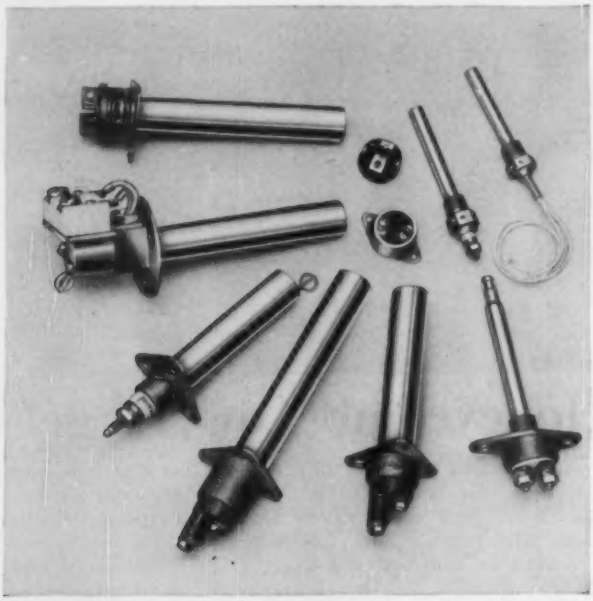
**1. PROVED DEPENDABILITY** for America's first intercontinental bomber. Boeing's B-52 jet engine Stratofortress uses Fenwal Fire and Over-Heat Detectors for fire detection dependability and extra safety. Fenwal units accurately reset following actuation. These *long service* Fenwal detector units are tamper-proof and dust-proof, compact and easy to install.



**2. EASY INSTALLATION.** Shown in Lockheed's transcontinental Super Constellation, these Fenwal unit Fire and Over-Heat Detectors are precision-set at the factory. Fenwal unit detectors eliminate the need for external relays, costly field adjustment and periodic maintenance. Fenwal units are in to stay — and stay right.




**3. COMPLETE FLEXIBILITY** for all types of aircraft. Fenwal units *anticipate* danger and give warning *before* emergencies occur. A single unit reacting will sound an alarm. Double loop circuitry guards against system failures, and gives duel push button operational check. Fenwal unit detectors meet exacting government and military specifications.



**4. GET FULL DATA** on Fenwal's *positive* Fire and Over-Heat Detectors, Heater Controls, Aircraft Gas Turbine Thermocouples and Accessory Controls. Fenwal manufactures precision devices for the entire aviation industry. Fenwal engineers can help solve *your* detection and control problem. Write to **Fenwal Incorporated, Aviation Products Division, 127 Pleasant Street, Ashland, Mass.**

**Fenwal Controls Temperature . . . *Precisely***

tion as it is and as it is likely to be for the next decade, NFS is sponsoring a number of studies.

Manpower studies include:

• **Shortages of Scientific and Engineering Personnel in Industrial Research,** title of the BLS survey mentioned above. It is based on a sampling of 12,000 companies. Survey includes all firms in this group with 1,000 or more employes, plus a sampling of smaller firms.

• **Estimating the Supply of Technical and Professional Manpower as of 1965,** a study Columbia University is conducting for NSF. Related studies are being made by University of Minnesota (Loss of Talent Through Educational Drop-out) and National Research Council (Studies on Doctoral Degrees in Science).

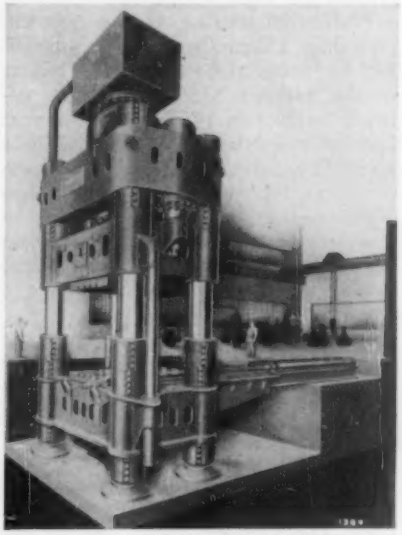
• **A Technical Study of Methods for Determining Demand and Supply of Specialized Personnel** undertaken for NSF by the National Bureau of Economic Research.

• **National Register of Scientific and Technical Personnel** to be brought up to date in cooperation with the nation's professional societies and associations.

• **Scientific manpower in the federal government,** a monograph which will show distribution by agency and will include information on military personnel engaged in scientific activities.

Studies on distribution of research funds include:

• **Research in industry.** Industry con-



## Heavy Hugger

**This new 8,000-ton hydraulic forging press has been designed and manufactured by Lake Erie Engineering Corp., as an adjunct to the USAF's heavy press program. Working area is 98 in. left to right by 58 in. front to back; maximum daylight is 110 in. Harvey Aluminum will use the press to forge heavy aluminum billets at Torrance, Calif. Press builder is in Buffalo, N. Y.**

UNCONTROLLED HEAT

A blazing ball of fire, product of a mysterious beginning, source of infinite heat, never more than the tiniest portion put to use.

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Of the various materials used for insulation of these woven heat elements, neoprene rubber is highly regarded where medium heat (−40°F to 200°F) is required. It provides flexibility, extremely good resistance to weather and erosion and is easily mounted by cementing.

In modern aircraft, neoprene-insulated heat elements, made by Safeway, play a vital role. They are used, for example, as de-icers on propeller blades, helicopter rotors, aircraft spinners and wings, or as heaters for batteries, parabolic antennae, rocket tubes and air intake ducts.

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To solve the increasingly complex assembly problems of aircraft, more special purpose fasteners are needed today than ever before. Shown here are four of these nuts. Each was designed by Nutt-Shel to solve a special fastening problem.

NS-132

HIGH STRENGTH, COUNTERBORED, SELF WRENCHING NUTS. Designed for semi blind applications, in areas where anchor nut rivet holes are undesirable; and where repeated wrenching may be required. In 1/4-28, 5/16-24 and 3/8-24 thread sizes.

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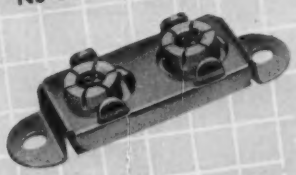
NARROW, RIGHT ANGLE, FLOATING NUT. Designed with a full .030 float from center. In 6-32, 8-32 and 10-32 thread sizes; corrosion resistant steel.

NS-144



DOUBLE FLOATING ANCHOR NUT. Designed for restricted bolt-to-bolt spacing applications. In 6-32, 8-32 and 10-32 thread sizes.

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SELF SEALING GANG CHANNEL. Nut assemblies are removable and replaceable. Similar to the widely used 4630H series. Nut assemblies may be readily installed and removed without special tools.

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ducts approximately 65% of the $4 billion research in the country. Federal and state funds finance 55% of the research, however.

• **Federal funds for science.** This is a continuing study—the latest report, Vol. IV, covering Fiscal Years 1954 through 1956, will be issued this summer. Federal R&D expenditures for Fiscal 1956 are estimated at $2.2 billion, an increase of $147 million over 1955. Basic research accounts for less than 7% of this total, NSF says. The Department of Defense accounts for about three-quarters of total federal R&D.

• **Research supported by the states.** This is subject of a study conducted for NSF by the University of North Carolina. States covered in the survey are North Carolina, New York, California, Connecticut, Wisconsin and New Mexico.

• **Research at non-profit institutions.** This covers expenditures in universities, financial support of graduate students, faculty and research manpower at universities, and research support by foundations. Russell Sage Foundation has learned that of a total of $142 million spent on research by foundations, only $26 million went for scientific R&D.

• **Research by trade associations** has been reported to NSF by Battelle Memorial Institute. Trade groups spent $11.8 million on applied R&D in 1953, and $3.3 million on basic research. Professional groups spent about $3.6 million in 1953, including close to $2.5 million for basic research.

NSF estimates that research over the preceding 25-year period was responsible for between $40 and $80 billion of the nation's $365-billion gross national product in 1953. Median annual cost of research for this period was about $1.5 billion. This indicates a payoff in the ratio of at least 25-to-1, says NSF, and raises the question as to whether we should not be investing more of the national income and effort in research and development.

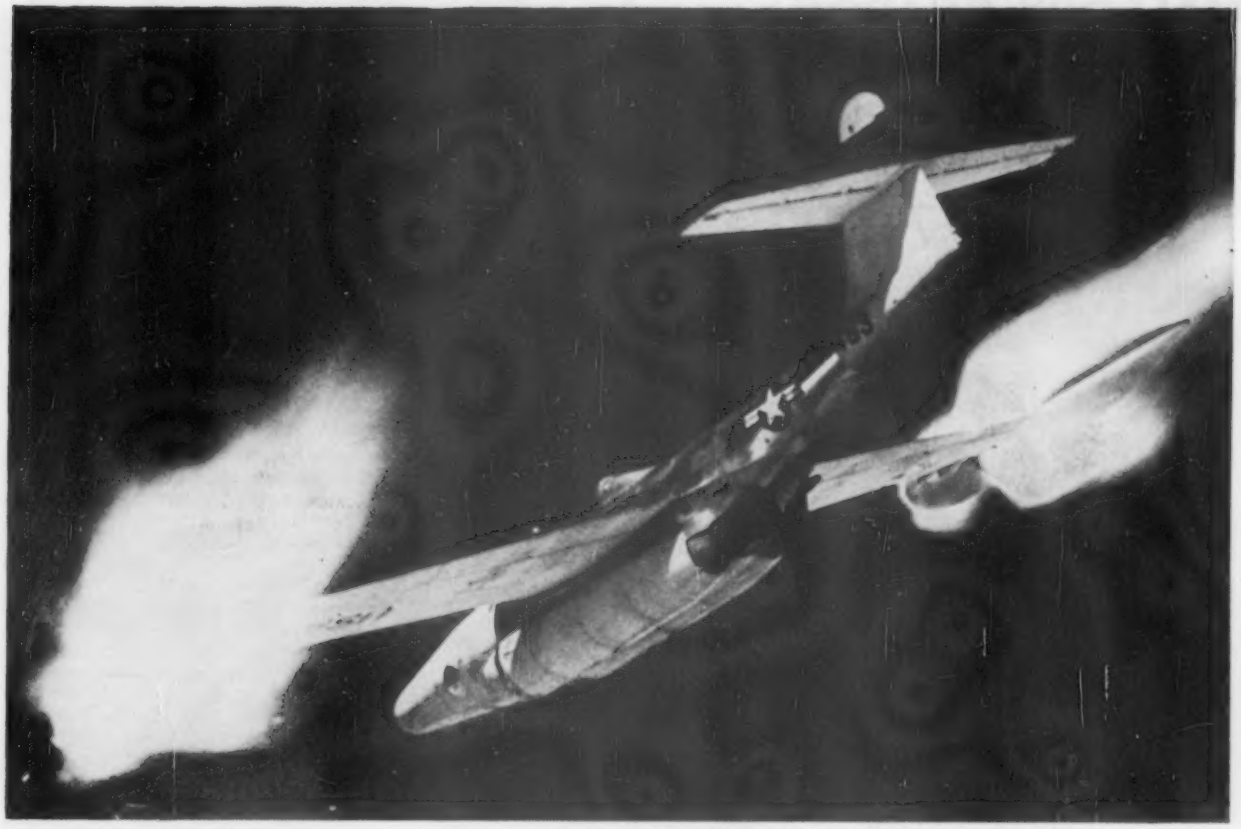
## Ground-Air Equipment Checks Camera Lenses

The Focalscope, developed under contract with Gentile Air Force Depot, is an instrument for measuring aerial camera lens position in relation to film plane, checking lens focus, and for use as an autocollimator. It is designed to be used in flight as well as on the ground.

Unit employs a self-contained light projected through the camera lens and reflected back into the eyepiece.

The equipment functions as a portable optical bench and can be adapted to handle lenses working with 9x9-in. and 9x18-in. film sizes.

Gordon Enterprises, N. Hollywood.



Northrop Scorpion F-89D unleashes 104 devastating 2.75 inch rockets, making it America's most heavily armed fighter-type aircraft.

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**MALLORY·SHARON reports on**

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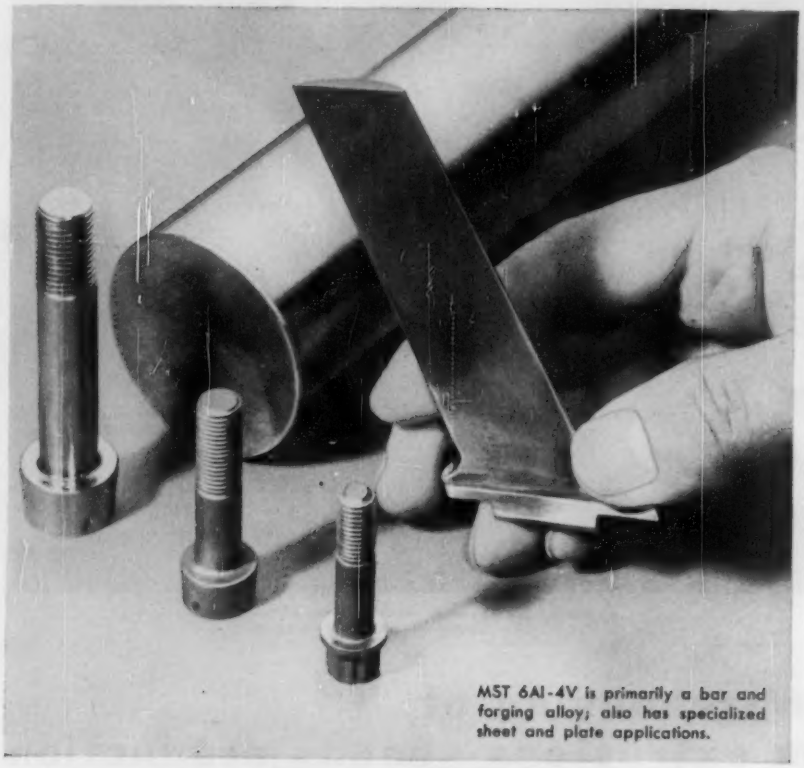

MST 6Al-4V is primarily a bar and forging alloy; also has specialized sheet and plate applications.

## NEW MST ALLOY
## "stays put" at high temperatures

● The problem of elevated temperature embrittlement present with many titanium alloys has been overcome with this newest development. MST 6Al-4V (6% aluminum, 4% vanadium, balance titanium) can be used at temperatures up to 750°F with minimum creep or change of properties. It has excellent strength and stability at high temperatures, is relatively insensitive to notches, and can be hot worked over a wide range. It can be readily machined, welded, or heat treated.

Like all Mallory-Sharon alloys, MST 6Al-4V is vacuum double melted, assuring homogeneity and consistent quality. Specify it for consistent, predictable, high temperature performance. A bulletin listing complete data is yours for the asking. Write Mallory-Sharon Titanium Corporation, Dept. B-7, Niles, Ohio.

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## AVIATION CALENDAR

July 11-22—Special summer program on Aerodynamics of Unsteady Flow, Massachusetts Institute of Technology, Cambridge.

July 12-14—Western Plant Maintenance and Engineering Show, produced by Clapp and Poliak, Pan Pacific Auditorium, Los Angeles.

July 16-24—Philadelphia Glider Council, annual open house, Philadelphia Gliderport, Hilltown, Pa.

July 27-29—Rotterdam Helicopter Congress, Rotterdam, The Netherlands.

Aug. 5-7—Experimental Aircraft Assn., third annual Fly-In and Convention, Curtiss-Wright Airport, Milwaukee.

Aug. 8-10—Institute of the Aeronautical Sciences, second National Turbine Powered Air Transportation Meeting, Olympic Hotel, Seattle.

Aug. 10-14—Air Force Assn., Convention and Airpower Panorama, San Francisco.

Aug. 15-17—Society of Automotive Engineers, West Coast Golden Anniversary Meeting, Hotel Multnomah, Portland, Ore.

Aug. 22-23—Symposium on Electronics in Automatic Production, sponsored by Stanford Research Institute and the National Industrial Conference Board, Sheraton-Palace Hotel, San Francisco.

Aug. 24-25—Western Electronic Show and Convention (WESCON), Civic Auditorium and Fairmont Hotel, San Francisco.

Aug. 24-26—International Ignition Conference, conducted by Scintilla Division of Bendix Aviation Corp., Sidney, N. Y.

Sept. 3-5—Twenty-ninth National Aircraft Show, Philadelphia International Airport.

Sept. 3-9—Aircraft Owners & Pilots Assn., eighth annual Roundup Flight Cruise, New York to Bermuda.

Sept. 12-16—Instrument Society of America, 10th annual Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles.

Sept. 17—Institute of Radio Engineers, Symposium on Automation, Cedar Rapids, Iowa.

Sept. 28-29—American Institute of Electrical Engineers and Institute of Radio Engineers, 1955, Industrial Electronics Conference, Park Sheraton Hotel, Detroit.

Oct. 3-5—Eleventh annual National Electronics Conference, Hotel Sherman, Chicago.

Oct. 4-6—Eleventh annual Aircraft Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Secor Hotel, Toledo, Ohio.

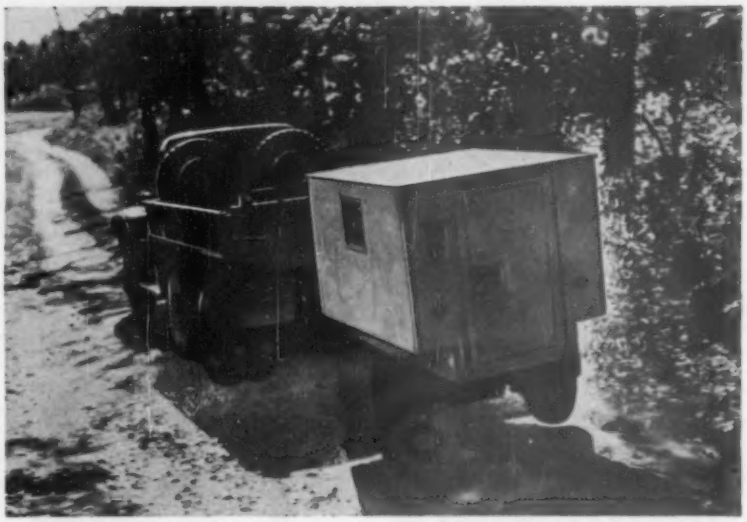
Oct. 5-7—National Business Aircraft Assn. eighth annual Meeting and Forum, Sheraton-Cadillac Hotel, Detroit, Mich.

Oct. 5-7—1955 National Airports Conference, sponsored by American Association of Airport Executives and University of Oklahoma, Norman, Okla.

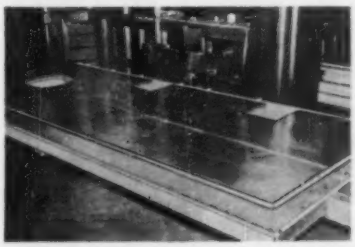
Oct. 11-15—Golden Anniversary Aeronautic Meeting, Aircraft Production Forum and Aircraft Engineering Display, Hotel Statler, Los Angeles, Calif.

Oct. 17-21—International Air Transport Assn., 11th annual General Meeting, Waldorf-Astoria Hotel, New York, N. Y.

# Air traffic control system made by CRAIG MACHINE, INC., gains high strength, all-weather protection with sandwich walls of NOPCO® LOCKFOAM



These light-weight vehicles really have to stand the bumps on any kind of road—and they do. In the factory, a 10-inch drop test onto solid concrete fails to loosen the Lockfoam's firm adhesion to the aluminum 'skin'.



**Ease of construction.** Illustration shows wall panel after top of mold has been removed. Lockfoam is poured between the aluminum sheets, completely filling the cavity —then solidifies.

**Like water off a duck's back.** In this test, the shelter is placed in a water tank and left for several hours. Because of its unicellular structure, Lockfoam resists water-sorption, a highly desirable characteristic in case of damage to the outer shell.

**Some Uses of Nopco Lockfoam**

*Fabricate Shock Paneling*
*Strengthen Shock-absorbing Systems*
*Insulate Cabin-ventilating Systems*
*Increase Rigidity of Ailerons, Rudders, Elevators, Wing Tabs*
*Provide a Strong Core for Nose Radomes*
*Pot Electronic Equipment*
*Stiffen Rocket Doors*
*Dampen Vibrations and many other uses*

Shelters of the mobile air traffic control system made by Craig Machine, Inc., Danvers, Mass., carry sensitive electronic equipment, to guide planes into airfields. In building them Craig found, as many others have found, that Lockfoam's ease of handling, its pour-in-place technique, offer important performance advantages and production economies over other plastics. Sandwiched between two sheets of aluminum, Lockfoam gives great strength and rigidity with light weight, and adheres firmly to the aluminum surrounding it. Lockfoam's low thermal conductivity insulates effectively against the weather.

By using Nopco Lockfoam, labor costs and waste of material are drastically reduced; a further saving is effected by eliminating the need for expensive equipment.

The technical service staff of Nopco's Plastics Division is at your service, to aid you in selecting, formulating, and applying Lockfoam to give you the greatest benefits.

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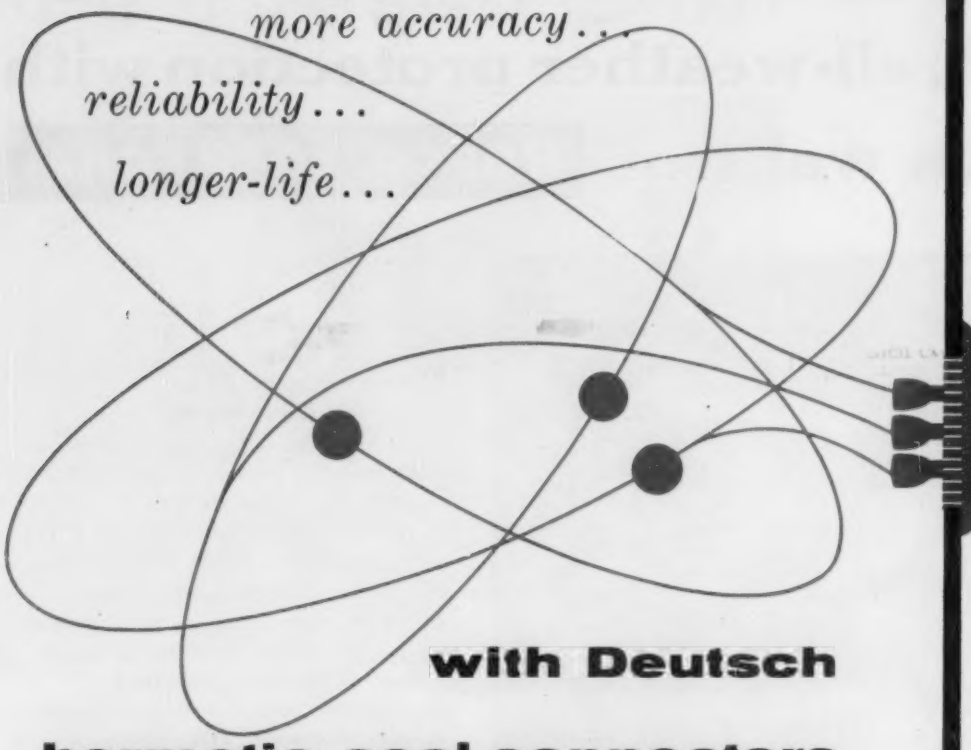
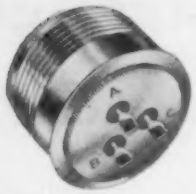
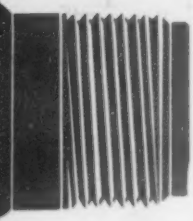
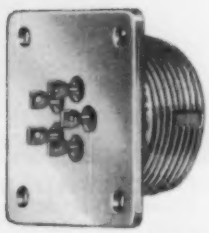


## with Deutsch hermetic-seal connectors



integral mounting receptacle





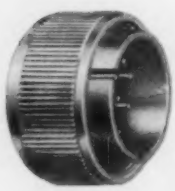
box mounting receptacle

Mechanical shock of 100 G's... thermal shock from –300°F to +500°F... bonding temperatures as high as 1000°F... operating pressure up to 7000 psi ... high potentials of over 1500 volts... all of these are reasons why Deutsch Hermetic Connectors will give *your* electronic equipment more accuracy... reliability and longer life.

Heart of these connectors is a compression glass seal obtained by a closely controlled process where special alloy pins are sealed with hard, resilient glass insulation under hundreds of pounds of pressure.

Shells have a tapered, serrated surface so connector is mechanically anchored against turning when pressed into device housing. High melting temperature permits use of any common method of bonding... soft solder to brazing.

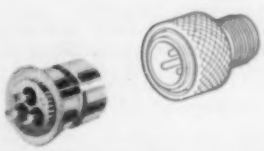
Pins are hard alloy with flat pierced ends or solder pots for easy connection and inspection. Deutsch Hermetic Connectors have standard AN contact arrangements and mate with all AN connectors. For information on sizes, shells and modifications, see your Deutsch Representative or write for bulletin AWH-4.



integral mounted plug

### 175 types of AN connectors stockpiled

There's no need to wait when you need AN connectors. The Deutsch Company's completely integrated manufacturing and stockpiling facilities make possible delivery of over 175 types. See your Deutsch Representative or write for bulletin AWN-4 for information on AN connector construction and available connectors.



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**HISPANO SUIZA R800** first ran last December, is rated at 2,860 lb. thrust, can touch 3,968 lb. with afterburner.

# French Impress With New Jet Engines

By William A. Waterton

**Paris**—Postwar French development in engines closely parallels the situation with regard to aircraft.

The long years of research and prototyping seem ready to pay off in production. That is the feeling of foreign observers at the 21st international Salon de l'Aeronautique at the Le Bourget Aerodrome.

After the war, prewar French piston engines, particularly in the lower ranges, were revived and German engines in production were continued. A few large liquid- and air-cooled types, such as the Hispanos and Arsenals, were also made. Licenses were taken out for new foreign engines to power postwar-designed French airframes. These were mainly of British origin (such as the sleeve-valve Bristol Hercules radial engine which powers the Noratlas Packet-type transport).

British jet licenses were also acquired for France's military aircraft. These were for the centrifugal-flow Rolls-Royce Nene and its development, as well as the Avon axial engine.

While these engines were produced and developed, France worked on her own native designs. Many manufacturers, such as Rateau, got into the act. But with the exception of the successful Turbomeca firm, most have faded out of the picture leaving as the three major jet makers Snecma, Europe's largest engine works, with 7,500 employes; Hispano Suiza, building mainly R-R designs and derivatives under license; and Turbomeca, whose range of light engines is unique in the world.

## The Picture Today

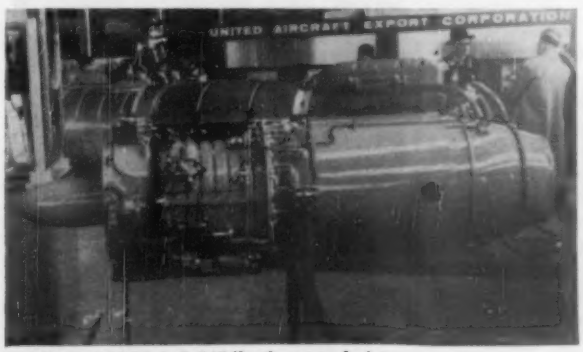
This is the situation of France's engine makers today:

• **Hispano Suiza** has built over 1,000 of the Nene series. They have gone into Ouragans (5,000 lb. thrust), Mystere 4As (6,280-lb. Tays). H-S has built Verdons, developed from the Tay, giving 7,720 lb. thrust, though an 8,160-lb.-thrust Verdon (without afterburner) was displayed at the Salon. There are 400 Tays on order for Mysteres, and they are directly interchangeable with Verdons. Hispano also proposes to build a late version of the R-R Avon. The company's plant is at Bois Colombes.

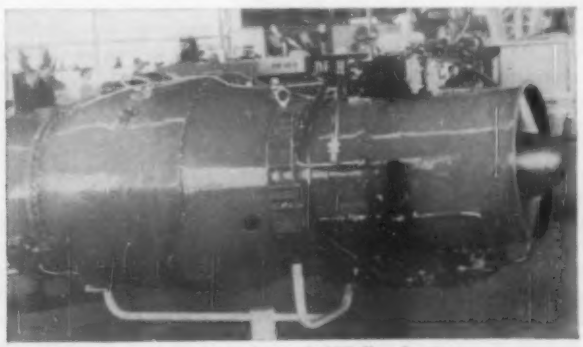
Hispano Suiza showed a new small axial-flow jet of its own design. Called the R.800, it is a pencil-slim six-stage axial equipped with afterburner. This small-diameter engine weighs 606 lb. and delivers 2,870 lb of thrust dry, and up to 4,000 lb. with afterburner. Dimensions of the R.800 are—length with afterburner, 79 in.; diameter, 23.5 in. It has a single-stage turbine.

• **Snecma** makes both jet and piston engines, air- and liquid-cooled, large and small, of native and foreign design (Hercules-Bristol licensee, for instance). Largest Snecma engine is the Vulcain, giving 13,500 lb. thrust on the test bed, but it was not shown at the Salon. An Atar 8 was however. This very clean engine produces 9,250 lb. dry, the highest yet for the Atar series.

A production Atar E, giving 7,700 lb. thrust was shown. This engine is used in the Vautour. The Atar series starting from the 6,200 lb. A, are used in many of France's latest fighters and prototypes. Earlier marks employ seven-stage axial compressors, annular combustion chambers and single-stage turbines. Typical dimensions and weights




**SNECMA VESTA** is 2,645-lb. thrust turbojet.



**GABIZOS** is new centrifugal jet; 2,425 lb. thrust.

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General Electric is now ready to provide a prototype gas thermocouple system for your aircraft gas turbine without charge. Whether rigid or flexible type, these systems can be designed to meet almost any requirement. Past prototype systems have been delivered for installation within 24 hours after date of original request.

**Advantages of G-E thermocouples**

Manufactured by the G-E Instrument Department in West Lynn, Massachusetts, your General Electric prototype thermocouple will have these advantages:

1. Lighter weight, because of self-supporting harness—there is no need to install extra mounting brackets on the tail pipe. This reduces installation cost and weight.
2. Greater reliability—because of fewer connections, G-E exhaust gas thermocouples are less apt to develop connector failures.
3. Fewer service problems—the thermocouple harness assembly and leads consist of only 3 pieces which makes for easier installation and reduces chance of lost parts.

**Better construction**

Every G-E thermocouple system is insulated with compacted magnesium oxide powder enclosed in a stainless steel tubing. This construction withstands ambient temperatures of at least 1000 F.

**Proven In Service**

More than 6 million flying hours have already been logged with jet engines using G-E exhaust gas thermocouples. They are used both in systems that indicate and in those that automatically control the temperature. The temperatures are normally in the 1200 F range with transients up to and above 1600 F.

For further information on ordering a prototype gas thermocouple system to fit your requirements, see your nearest G-E Apparatus Sales representative. Send in coupon below and check off "A" to get bulletin GEC-1297, for a rundown on the complete line of systems offered.

# 400-cycle alternator meets tough guided missile demands

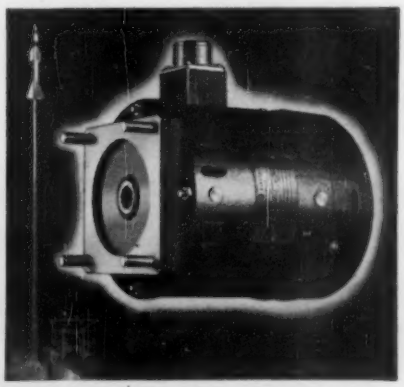
Developed to withstand the tremendous range of shock, temperature and atmospheric conditions encountered in guided missile applications, the G-E explosion-resistant 400-cycle alternator meets rigid environmental and military specifications (MIL-E-5272A). Rated up to 1500 volt-amperes, 12,000 rpm, for output of 115 or 208 volts, the unit is designed to be driven by a wide variety of motor, turbine, and ram-air drives.

The alternator can be readily coupled to a drive unit with an AND 10261 or AND 20001 mounting pad. Modifications of these mounting pads can be made to meet specific application requirements. The unit is very versatile in both construction and application, and can be manufactured to produce more output when required.

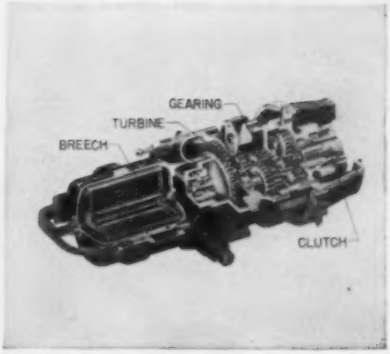
Weighing only fourteen pounds when equipped with the AND 20001 mounting pad, the new alternator is a lightweight unit having an unusually high power.

To meet requirements of MIL-E-5272A regarding altitude, shock, temperature, vibration, humidity, foreign elements, and centrifugal force, the alternator underwent exhaustive testing—a standard procedure for all G-E aircraft and armament motors.

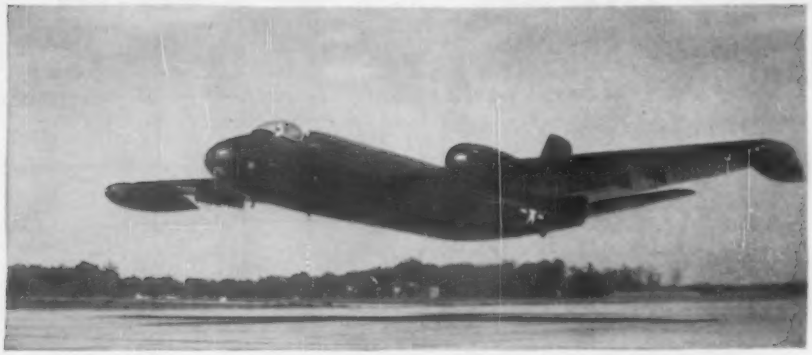
For more information on how this motor can satisfy your aircraft and armament problem, check "C" in coupon for GEA-6269B, and return to address indicated. Remember—your specifications are all that G-E engineers need to handle your toughest requirements.



New 400-cycle alternator passed rigid testing to meet specs regarding altitude, shock, temperature, vibration, humidity, sand and dust, and centrifugal force. General Electric offers hundreds of other type motors to meet any aircraft requirement.




Cutaway view of cartridge starter for jet engines shows main operating parts.



B-57 takes off after fast start with General Electric cartridge turbo starter. Pilot is able to get immediate highly dependable starts at the push of a button. Starter torque output is relatively constant providing rapid start without damage to jet engine gear train.

# Cartridge starter turns over Martin B-57 jets fast for quick takeoff

A small General Electric cartridge starter that will kick off the Air Force's Martin B-57 for a quick takeoff is now in operation.

The new starter, known as Model S-12, uses a solid propellant charge which is ignited electrically at the push of a button. The rapid burning of this charge provides hot gases which turn a small turbine wheel. This wheel is engaged through a reduction gear system and clutch to start the pump's jet engine power plants.

### Allows Take Off From Any Airfield

Importance of the cartridge turbo starter is that it permits fast starts on planes scattered over any part of any airfield, without ground power, since no ground power units are needed for starting. Every B-57 carries it own engine starting power. Further information on this starter can be obtained from your nearest G-E Apparatus Sales representative, or by checking "B" on coupon below and mailing in for bulletin GEA-5872A.

# G-E transformer rectifier designed for reduced weight

Aft compartment of B-36 shows G-E transformer rectifier mounted for easy inspection.

Converting a-c power to d-c on the Convair built Air Force B-36 are General Electric airborne transformer rectifiers. The units are designed to offer a lightweight means for obtaining on-the-spot direct current required for the d-c equipment, and eliminate the long, heavy d-c bus runs and d-c generating equipment which would otherwise be required.

### Transformer rectifiers to your applications

These transformer rectifiers, as well as the other models now being currently produced by G.E., offer a lightweight, highly dependable, flexible source of direct current, and require a minimum of maintenance. G.E. now covers a range of applications for 208 volt a-c aircraft power supplies ranging from 1 amp to 200 amps, both regulated and unregulated. Regulation is accomplished by means of magnetic amplifiers. D-c output can be filtered to meet almost any ripple specification. Efficiency varies between 72½% and 85% depending on conditions of operation and the type of unit.

### Designed for your requirement

Regulated units can be paralleled with each other or with a d-c generator. Cooling is done by convection, or fan. Protective features such as undervoltage relays and overvoltage relays can be provided.

For further information on these new lines of transformer rectifiers, see your nearest G-E Apparatus Sales representative. General Electric Company, Schenectady 5, New York.

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Company..... ☐ For immediate project

Street..... ☐ For reference

City..... Zone..... State.....

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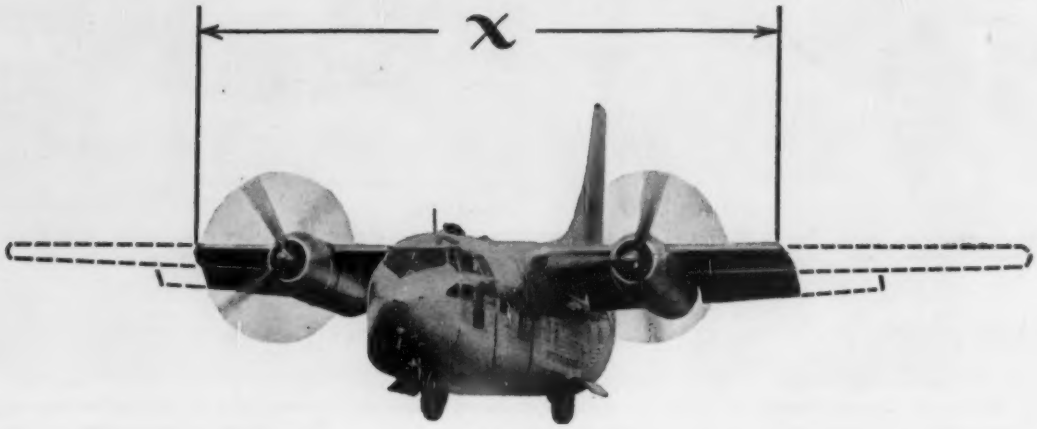


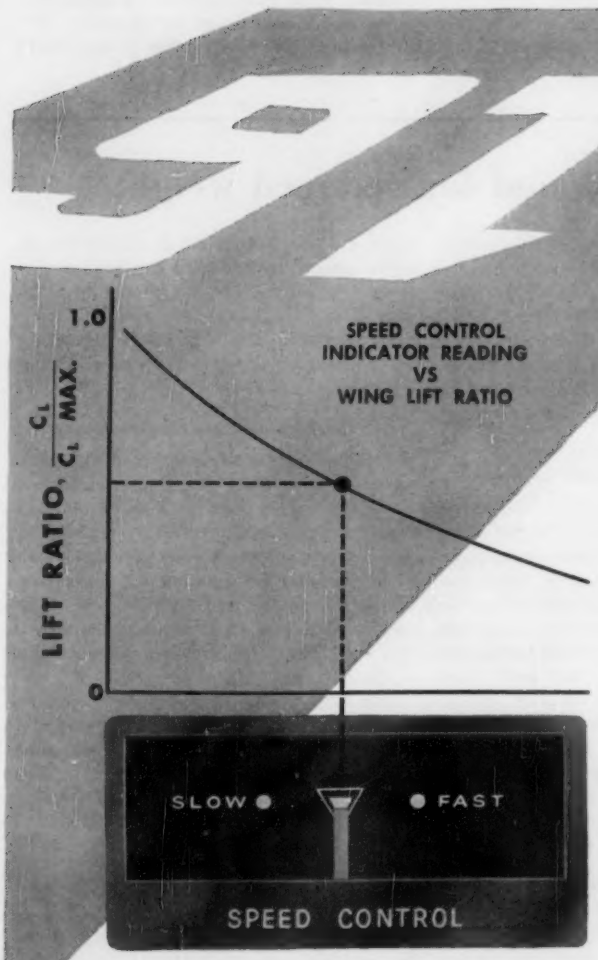


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The Safe Flight Speed Control System is now standard equipment on all Fairchild C 123B aircraft.

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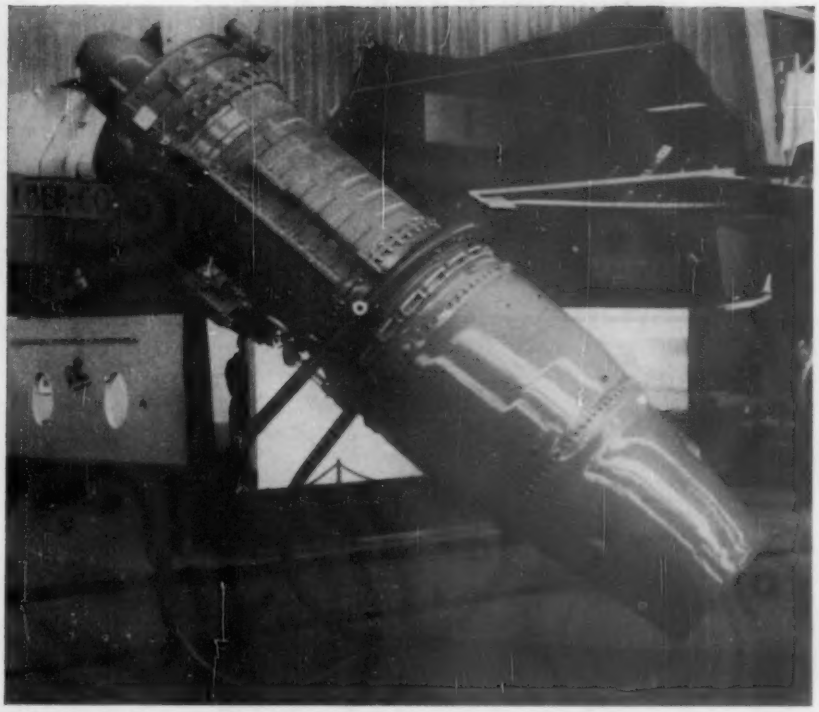

**SNECMA ATAR 8, rated at 9,259 lb. static thrust, is highest-rated of company's line.**

for a 6,600-lb engine: length, 140 in.; diameter, 36 in.; weight, 2,150 lb. Specific fuel consumption is 1.04.

Snecma's newest engine, the Vesta, is built to the same specifications as the Hispano R.800. The Vesta R.105 is a seven-stage axial-flow jet that takes after a scaled-down Vulcain in many respects. Ten injectors feed into an annular combustion chamber. De-icing air for the intake is bled from the compressor. Shafts through top and bottom front bearing struts drive accessories. The Vesta has been running since the latter part of last year—slightly longer than its rival Hispano R.800. The show engine had no afterburner, though one is running on test.

Snecma also builds afterburners of the horizontal "eyelid" type, and an annular ring thrust reverser licensed in the U.S. and Britain. Now in production, it will be fitted to squadron Mystere 2s as standard. Up to 50% reverse thrust is claimed.

• **Turbomeca.** This firm has become world renowned for its comprehensive series of light jet engines, shaft turbines and air compressors. These are employed in light trainers and transports, as airliner boosters for takeoff and in helicopters (two of which have held world altitude records).

Turbomeca added five new engines to its list at this year's show. With notable power increases, this firm's engines are now moving out of the light class into realms already exploited by others. Largest of the Turbomeca line is the all-new Gabizos, a 560-lb. centrifugal compressor engine which delivers 2,425 lb. static thrust; continuous cruising thrust is quoted at 1,940 lb. for a specific fuel consumption of 0.96. The Gabizos is 26.5 in. in diameter and resembles other Turbomeca engines in its bulbous appearance. It has been running about a year and has done a 20-hour type test. So far no afterburner has been fitted. It was built to the same spec as Vesta and R. 800.

Next in size is a yet-to-run 380 lb., 22.5-in-diameter centrifugal flow engine, to give 1,450 lb. thrust. It is the Gourdon, a development of the well-established 880-lb. thrust Marbore.

Two other new engines are in roughly the same power class. The Arbizon is running and gives 550 lb. static thrust. The Soulour has yet to run. Its dimensions: diameter, 18.5 in.; weight 310 lb.; thrust, 700 lb. At a cruising thrust of 600 lb., the specific fuel consumption is given as 0.78.

Last of the new Turbomecas is well under way in its test. A development of the Palouste air compressor, it is called the Autan. It weighs 220 lb., and pushes out 3 lb. of air per second. The compression ratio is 5.1 to 1. Fuel is consumed at the rate of 6.6 lb./min.

• **Dassault,** maker of Mystere fighters, is building the British Viper under license. This is the wingtip engine of the Trident.

• **Other French engine firms** are Lutetia and Minie, building small four and six-cylinder light engines of 44 to 80 hp. Salmson, an old established firm whose main line is good motor cars, also builds small engines, mainly radicals of four to nine cylinders, giving


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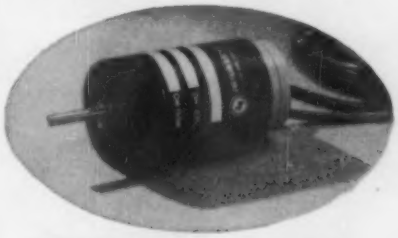

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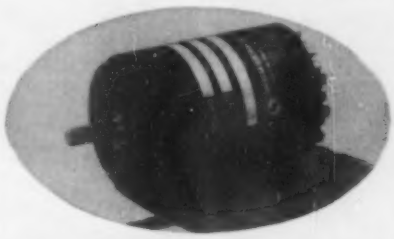

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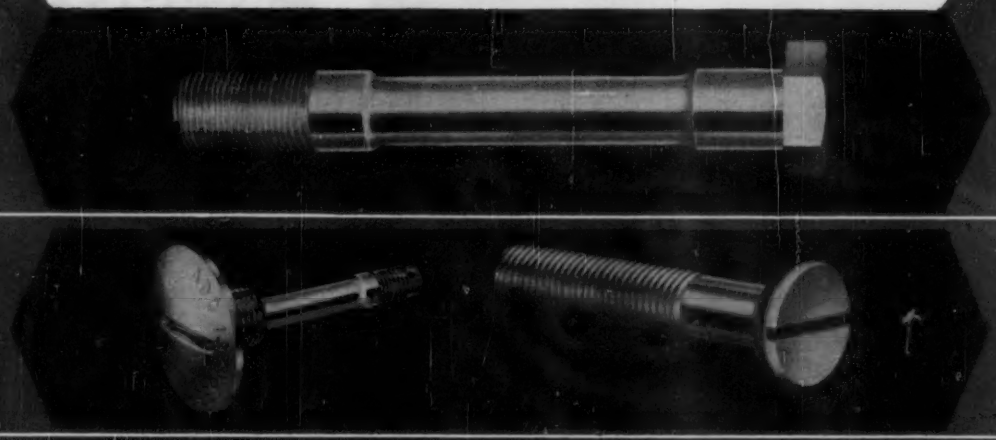

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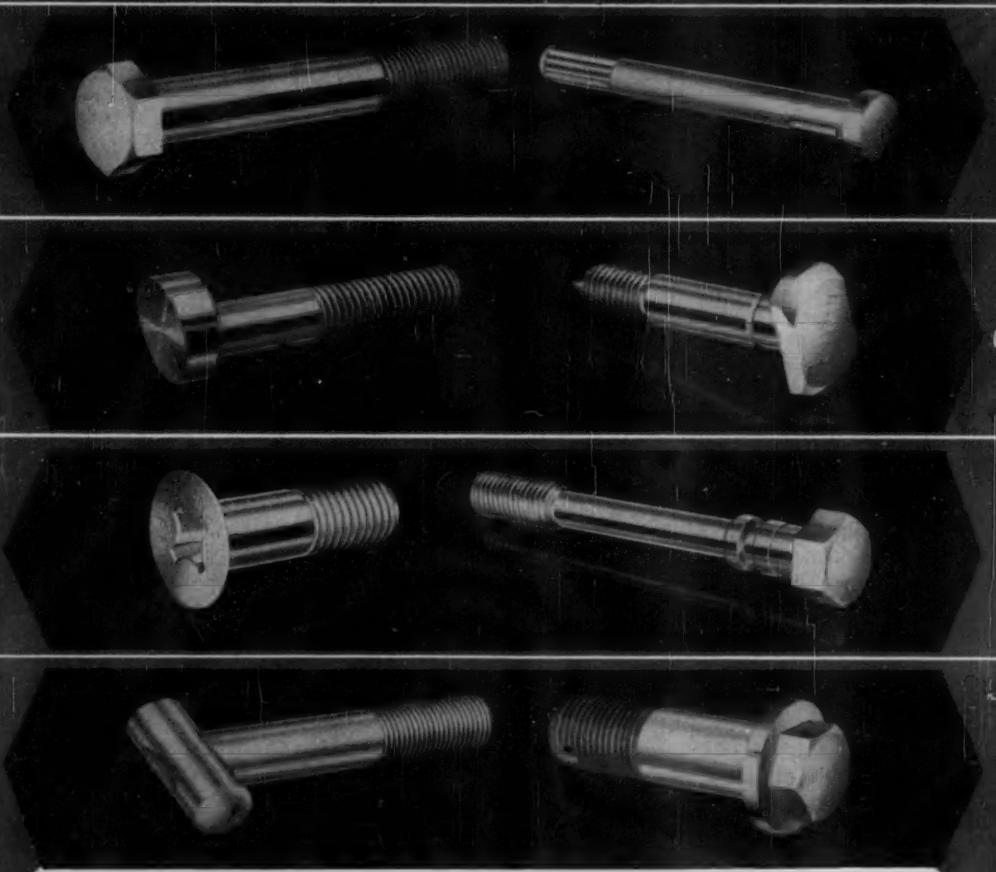

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60 to 260 hp. Potez, which also builds airplanes makes a series of engines—all air-cooled—from four to eight through six inverted cylinders, giving 150 to 475 hp.

• **De Havilland,** the British firm, showed a new, slightly larger version of its well-known air-cooled inverted four cylinder Gipsy with a new induction system giving 200 hp.

**Foreign Engines**

Surprise in the small-engine line came from Czechoslovakia, marketed by Motokov of Prague, it is the Praga Doris B. A beautifully made overhead camshaft flat six of 7.1-liter capacity, giving 200 hp., it weighs 439 lb. dry. The propeller is geared to 1,600 rpm. from full speed of 2,900 rpm. Fuel consumption is given as 0.51 lb. hp. hr.

Compared with a U.S. Continental engine shown, the Doris B stands out by its external finish. The Czech engine is in production.

A Wassmer conversion of the 850-cc. Panhard flat twin aircooled car engine was exhibited. For a weight of 143 lb. it gives 35 hp. Together with Volkswagen 27-hp. engine, it powers many of France's built-it-yourself planes.

Various ramjets and pulse jets are made by SNECMA. Rocket motors of the Sepr type were seen in action, but no details were given.

Curtiss-Wright exhibited information to the effect that its ramjets were used on experimental aircraft. A 60% power turboprop version of the J65 was also mentioned by C-W, to be available in 1960. Its big feature: reliability. No new American engines were displayed.

Britain showed publicly for the first time the Bristol Orpheus. The 800-lb. engine which had passed the 150-hour type test was the actual one shown. By now, it may well have flown in the Folland Gnat—remarkable in that it has only been running six months.

Compared with the small French engines, Orpheus is tubby and of considerably greater diameter, though short. It is understood to use the high pressure spool of the Olympus as its compressor. Tested at 3,250 lb. thrust, the Orpheus is expected to give 4,850 lb. when developed. This is to be boosted to the order of 7,500 lb. with afterburner. Bristol also showed its Proteus turboprop and Olympus 101 (11,000 lb. thrust). Much smaller than the 10,000-lb. thrust P&W J57 shown, it is understood to weigh 1,000 lb. less. But for every single Olympus, scores of J57s exist.

Armstrong Siddeley's prize exhibit was the new Sapphire 7, of 10,200 lb. thrust, compared with 8,600 lb. for the Mk. 6s in service.

Rolls-Royce showed an Avon R. A.


Jet Parts and Assemblies

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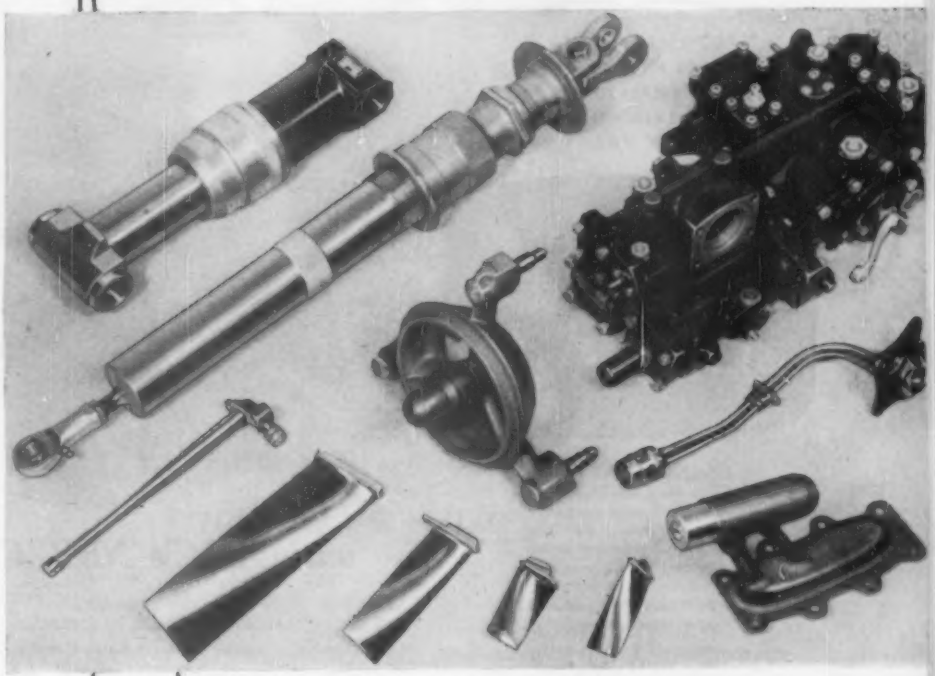

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28, of 10,000 lb. thrust. Its compressor appears to have much in common with that of the Sapphire. Also open to public view was the short-life (10-15 hr.). Soar missile and assist engine, a simple tube—275 lb. in weight, 15¾x77 in.; 1,860 lb. thrust.

### Small Planes, Small Engines

One of the great trends at the show was a return to small dimensions and simplicity and cheapness.

This is evident in the French approach to jet trainers compared to those great sized efforts of Holland and Italy in the same field. (Incidentally, the Canadians are extremely interested in the Fouga Magister and have been thoroughly evaluating it).

The French engines under discussion were intended for a new series of French light military aircraft. Originally single-engined, some are now being revamped to twin-engine designs, probably in light of the power of single-engine foreign competition (the Gnat and the Fiat G-91 are both Orpheus-powered).

A multitude of light fighter designs was shown—they are summarized below:

• **Breguet.** This firm produced a light design hoping for a NATO order, which went to Fiat. The Taon (Horse-Fly) design had been selected, but other considerations often dictate orders.

Using a single Bristol Orpheus, the Taon is a conventional sweptwing fighter with twin lateral intakes. The wheels retract into the fuselage. Various armament can be slung under the wings.

Having much in common with the Taon is the Breguet 1100 ordered by the French Air Ministry. Swept wings (43 deg.) are similar for both planes. The 1100 is a bit larger and uses two side-mounted engines of the new French class. It should fly at the end of next year.

A Breguet novelty is the Type 941, of which a small experimental model is being built. In side view, it resembles a C-130. Head on, four huge slow-turning props, driven by Turbomeca 450-hp. turbo engines cover the whole wing of the 941 with slipstream. Full-span multiple slotted flaps direct the slipstream to a powerful downwash, which it is claimed will get the plane into the air in some 60 yards, fully loaded.

• **Dassault.** A model of the Mystere 22 was seen to have a lot in common with the Breguet 1100. It was also quite conventional, with laterial intake feeding the light twin engines. The French Navy is reported interested in this plane.

Dassault also has plans for the Mystere 24, powered by a single Orpheus. Another light Dassault fighter is the M.D. 550 now taxiing and nearly ready to fly. No plans were shown, but the aircraft is understood to weigh around 8,000 lb. and be of delta layout. It will use two M.D. 30 Vipers, to which Dassault wants to add afterburner. The M.D. 550 (named Durandal, after the legendary sword of Roland) will be level supersonic, says Dassault. The Mysteres 22 and 24 carry two 30-mm. Hispano cannon or, for ground attack, four 12.5-mm. machine guns. It is reported the 550 will be armed with missiles. All three planes, it is claimed, will get off and on in 1,100 yards using grass airfields.

• **Sncan.** A fighter version of the Atar-powered Gerfaut seen flying at the show is designated the 1501. Except for a delta layout and a weight something under 10,000 lb., little could be learned.

• **Fiat.** The Orpheus-powered G.91 light fighter selected by NATO was shown in model form. It is virtually a baby F-86K as made by Fiat.

• **Coleopter.** Annular wing, flying barrels are the pets of engineer Zborowski. Snecma has for some time been working on these ideas. Coleopter military and civil designs, as well as guided missiles, are being studied. With compact dimensions, vertical takeoff ability and high speeds, the Coleopter is arousing much interest in France.

• **Leduc.** Showed a very interesting

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Chief Project Pilots, Tom Lloyd and Fred Hughes, join on the ground, prior to debriefing, following an afternoon air-to-air gunnery check on a fighter armament system.

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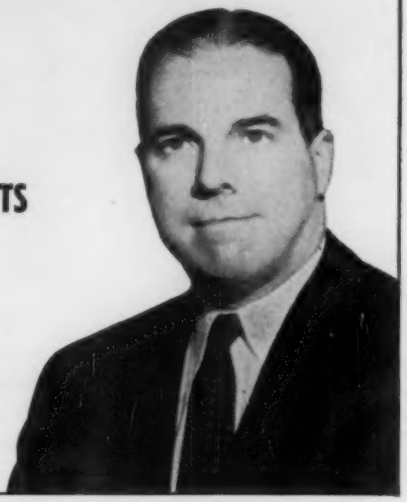
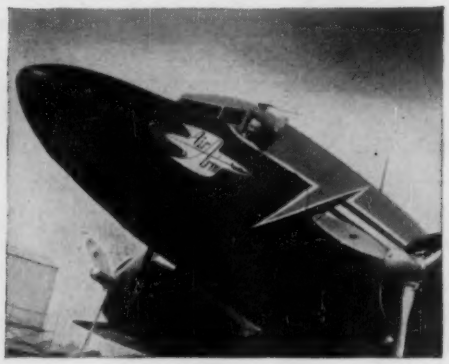


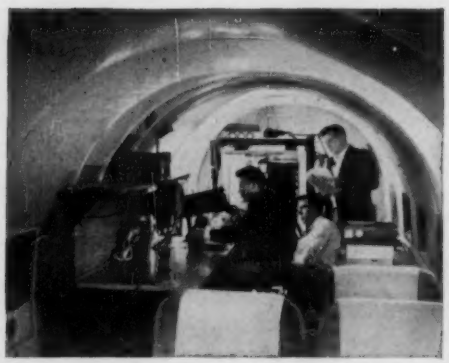
### Mr. M. T. Lang

Can Milt Lang help you? Contact him at Westinghouse Electric Corporation, 501 St. Paul Place, Baltimore 2, Md. Telephone PLaza 2-0300. Or see his counterpart in your area through your local Westinghouse office.

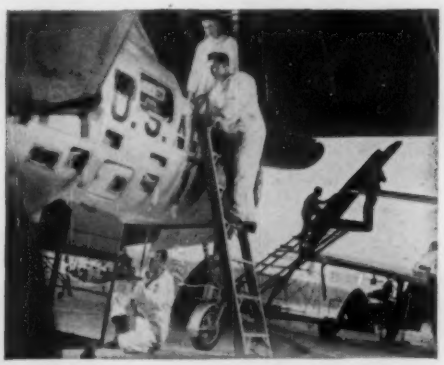


Bill Tyler, in charge of flight activities at the Center, applies his experience to the operation of flying test beds. In the Air Arm DC-3 Flying Lab, equipment gets a positive assessment of flyability.

Tom Lloyd, a chief project pilot, holds briefing with project and supervisory engineers. Finding the difference between simulated and actual performance is the reason for Air Arm Fight Testing.



A new fire control system is getting this Air Arm shakedown, using the DC-3 Flying Lab as the proving ground. All equipment gets this evaluation under actual in-flight tactical situations.



Complete support to operate flying test beds is an integral part of Air Arm. Maintenance is done on all types of aircraft by experienced ground crews using the finest equipment and hangar facilities.

J-91030-A

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form of construction as used on his 0.21 ramjet airplane—part of a wing. This was a beautifully machined top wing surface with deep integral spanwise stiffeners. The interesting thing about this 18-ft.-long section was that it was produced by an ordinary wing spar milling machine. Relatively narrow sections are so machined, then bolted together spanwise along a heavy machined flange. A few ribs of heavy section are fitted.

The wing structure of the Trident was shown to be of the sandwich type—aluminum foil between heavy-gage top and bottom skins.

### Accessories & Equipment

The French aircraft industry has advanced rapidly with respect to the vast amount of accessories and equipment of a varied nature needed to produce modern aircraft.

France now produces over 80% of the equipment of her airplanes. Gone are the times when postwar French planes used vast quantities of American, British and German equipment.

French equipment is of excellent quality and design. Her Jacotet control boosters were some of the first used in quantity in Europe. French fighters had full power controls when British were still boosted. The Super Mystere has a powered slab tail, and the Tridents have powered tail controls. Particularly noticeable during the flying part of the show was the positiveness and accuracy of control of the French aircraft. In this respect they appeared to excel their British counterparts, and rival, if not better, the Sabre.

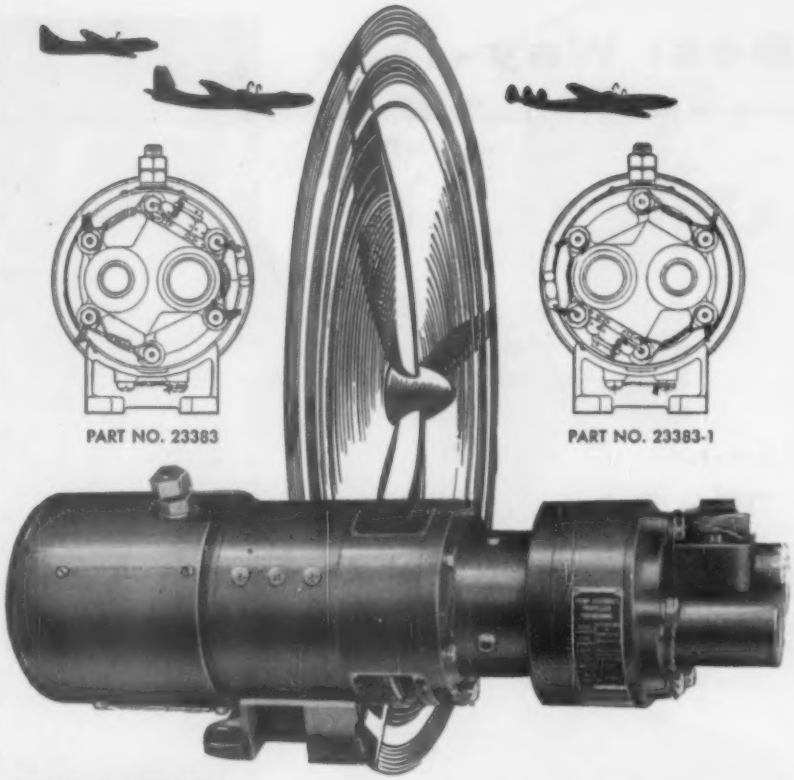
French electronics and radar are particularly good, and new applications were seen at Le Bourget.

First was a form of 3D radar location which is made by the firm of RVB & RI.

It does with one set what formerly required two or more installations. It provides two adjacent screens on one of which the operator sees the normal blip which provides bearing in azimuth and also shows movement. The second screen shows range and altitude as horizontal and vertical lines of light. No computations are required and there are no resulting time lags—ideal for missiles, fighter control, etc.

Secret of the equipment is an AM antenna rotating 360 deg. in azimuth with the reflector, but fixed vertically. Inside is a small rotating beam projector, the movement of which throws out 800 pulses a minute up and down the antenna. Result: The sky out ahead is covered with a vertical up-and-down-sweeping pencil beam—like slapping paint on a board fence.

Another use of radar was shown in a demonstration using a normal daylight type civilian television set. An elec-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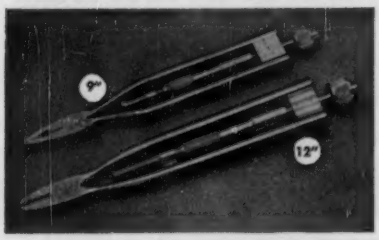


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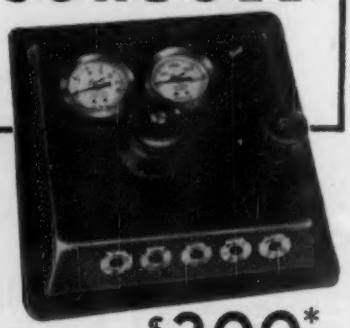

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tronic "camera" photographs the display tube which is transmitted over a civil television network. The situation can then be studied in daylight on any television screen. Several airfields and control centers can be provided with traffic information utilizing only one radar setup. Moreover, employing afterglow tubes, information and traces can be retained for up to half an hour. In the demonstration, the television station northwest of Paris at Pontoise was broadcasting the entire air traffic position 30 miles around Paris in all directions.

Spiral television was also shown. Instead of the scanner painting the picture as it went round, the "painting" commenced round the entire periphery of the tube and worked inwards to disappear in the center. Spiral scanning and presentation in television was also shown. On the screen the total scene could be magnified or reduced from the full screen size to one down to the size of a quarter in the middle of the tube. Focus and clarity remained.

Instrumentation is advanced, and in some fields clearly leads the rest of Europe. The Husseneau continuous trace multichannel recorders are renowned for their accuracy. They are widely used for prototype instrumentation.

The salon proved that the continent of Europe can design and build modern civil and military airpower, and missiles too, of which several were shown though not much was given away.

The same is true of pilotless targets and missiles, such as the French Nord target, the CT-20 (boosted off a ramp, jetpowered, and just subsonic).

There is now a choice of well-proven designs in the military and civil fields, though heavy bombers or large transports are notably lacking, due to a shortage of funds.

There is production—limited only by lack of funds and big thinking. And there are designs for the immediate future as well as long-term products. To these can be added what Britain is undoubtedly saving to show at her own Farnborough display in September.

Americans, perhaps, have had a tendancy to discount European aircraft industries and capabilities. In the past they have been justified, but this year for the first time since the war things are really looking up.

The continent's own industry with American help has justified itself and is standing largely on its own feet even though on a small scale by U.S. standards.

*This is the third and last of a series of special reports to Aviation Week on the 21st International Salon d' Aeronautique by William A. Waterton, famous British test pilot and air correspondent of the London Daily Express.*

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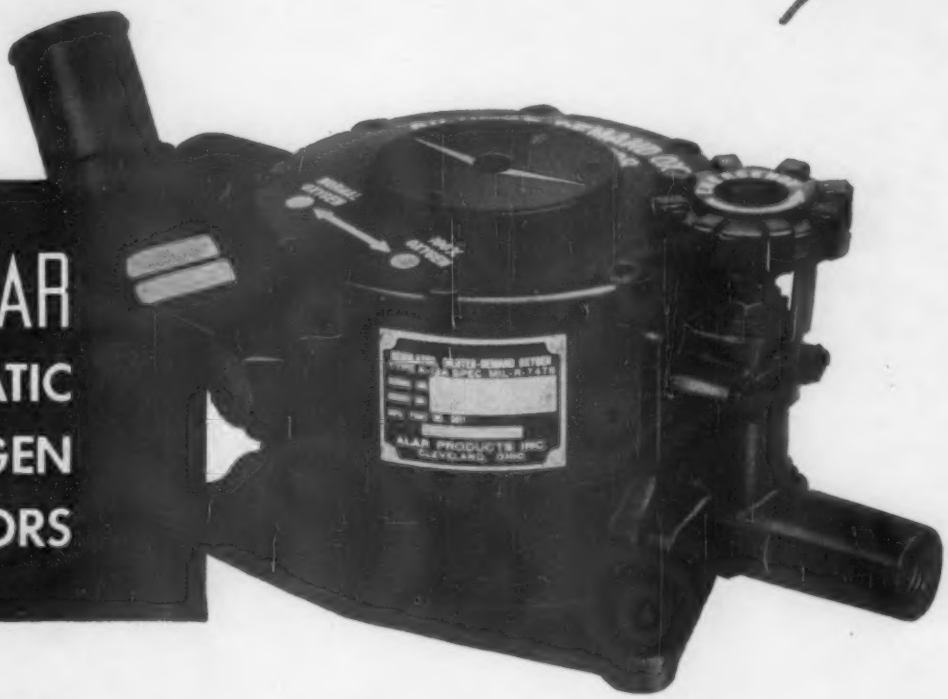


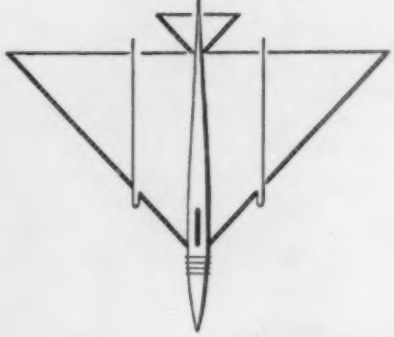

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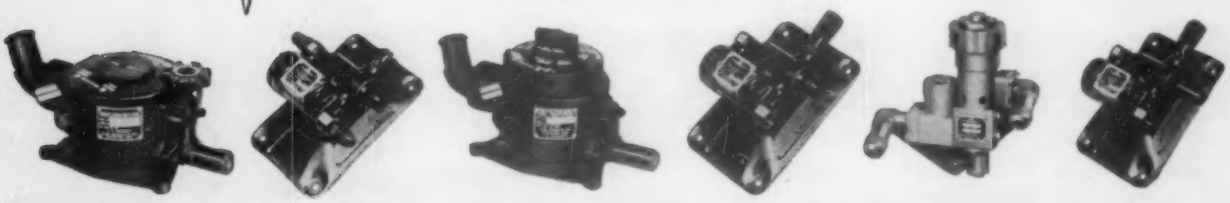

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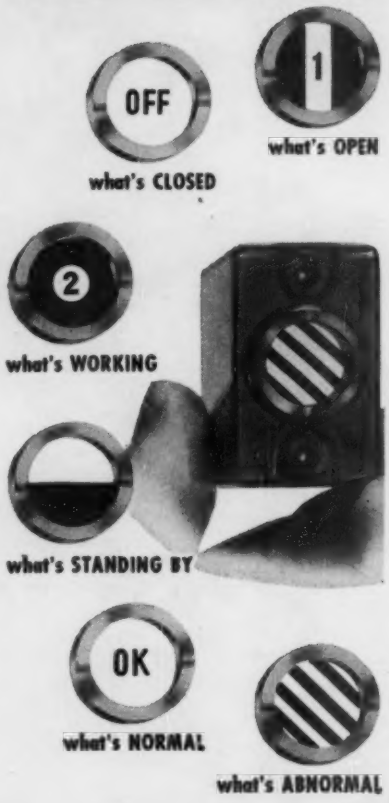


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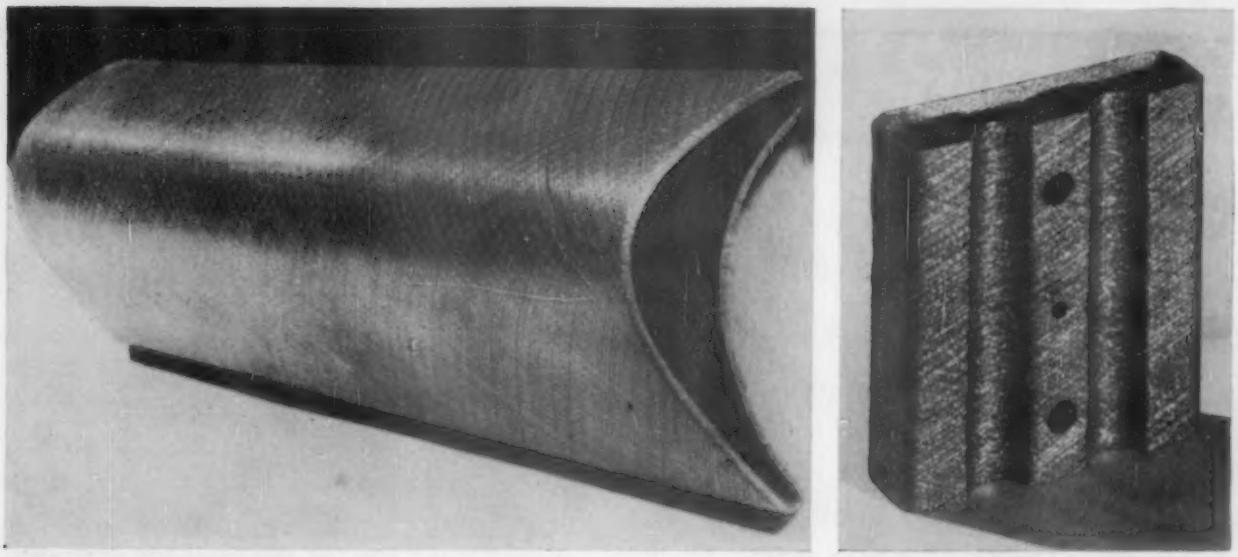
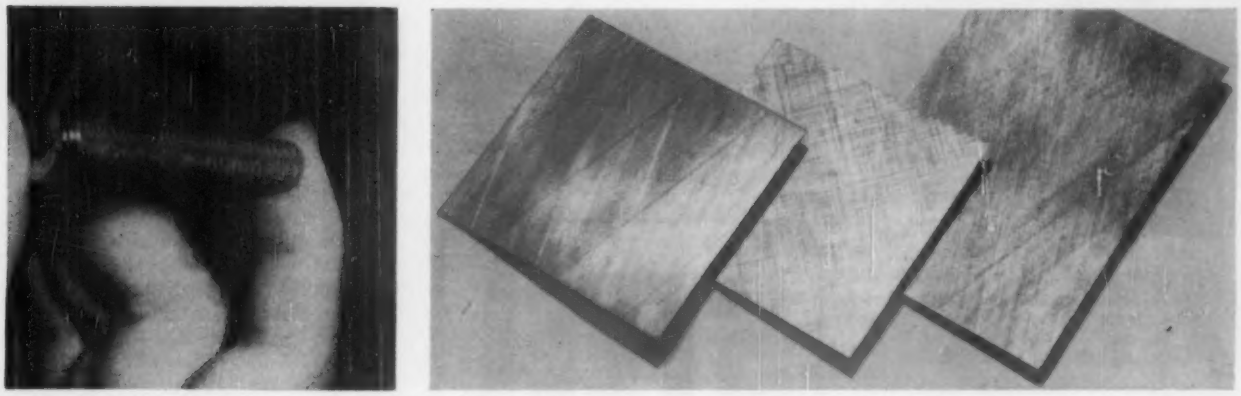


**POROLOY BLADE** at left was made from seamless cylinder. Part at right, formed of Poroloy sheet, is welded on left edge.



**FILTER** for F4D-1 Skyray has silver-soldered threaded flange. Poroloy patterns may be varied (right) to change properties.

# New Sintered-Wire Porous Metal Shows Promise for Aviation Use

By Irving Stone

**Los Angeles**—A new porous metal shows promising possibilities for aviation applications such as high-temperature wall cooling, filtration and boundary layer control.

Known as Poroloy, the material is a sintered-wire porous metal. It is formed by positioning the wires mechanically in a predetermined relationship, then sintering them in a controlled-atmosphere furnace.

There is no bonding agent as such. No powdered metals are used. The only raw material is wire.

In effect, the material is a configuration of voids, with their size and path and the material thickness tailored to give desired permeability or micronic filtration. It is manufactured and applications were developed by Poroloy Equipment, Inc., Pacoima, Calif., under license from California Institute of Technology.

Poroloy was developed under Army Ordnance contract at CalTech's jet propulsion laboratory, where it was invented by H. L. Wheeler, Jr., formerly of the lab, and now president of the manufacturing company. Also associated in the development at CalTech was Dr. Pol E. Duwez, former head of the lab's materials department, now professor of mechanical engineering.

## Materials & Methods

Poroloy may be made in:

- **Large flat sheets** with a wide range of thicknesses.
- **Large seamless parts** such as cylinders and cones.
- **Long thin-wall tubes** ranging from ¼ to 18 in. in diameter.
- **Metal makeup** of stainless steel, Inconel, Haynes alloys, N-155, Nichrome, nickel, copper, brass and many others.

Because of Poroloy's ductility, it may be fabricated by cold forming, drawing, swaging, spinning or rolling. It may be punched, sheared, and welded (Heliarc, seam or resistance).

## Production Items

A production application for Poroloy is on the Douglas F4D-1 Skyray. Here it is used in the hydraulic system as a coarse filtration unit with ability to withstand high pressure drop at high flow. The part is a tubular configuration about 2 in. long and 0.33 in. in diameter, with a ½-in.-diameter threaded flange silver-soldered to the tube. The flange screws into the control valve for a control surface.

Another production filter element

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for Aircraft

**Wemac Lights are designed for efficient heat dissipation and simple bulb replacement. They permit a wide range of locations using a standard unit.**

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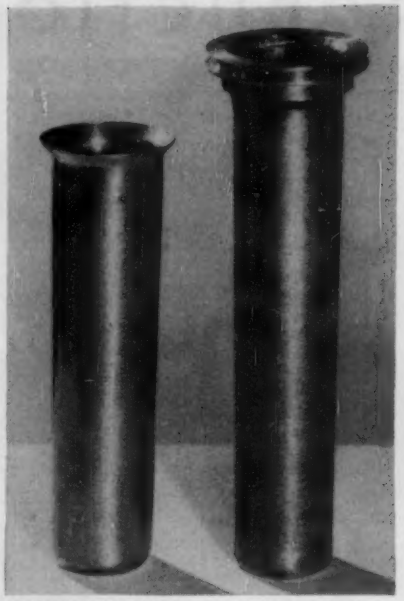

**FILTER ELEMENTS** of stainless steel Poroloy for Corporal's ground equipment.

**POROLOY SHEET** cooled by air stream resists melting by oxy-acetylene torch.

that Poroloy reports is a 10-micron unit for the ground handling equipment of the Firestone Corporal missile system. Used to clean air in a 3,000-psi. line, the filter material is said to be sufficiently strong to take pressure surges without danger of rupturing and sending particles through the system. Also, the element resists vibration and rough handling in the field, without slough-off.

Development parts or materials have been supplied to Convair, Lockheed, North American, Boeing, Chance Vought, General Electric, Pratt & Whitney, Allison, Curtiss-Wright, Westinghouse, and others, Poroloy Equipment reports. Items include:

- **Special configurations of sheet material** for sweat-cooling service in high temperature applications.
- **Sleeve** for supplying anti-icing fluid to nose radome. This unit fits over a nose spike. Fluid, evenly distributed to the sleeve, is carried back by the airstream to the radome.

Other possible anti-icing applications include leading edges of wings and of jet engine inlet struts.

- **Combustion chamber or liner.** Advantage in this application is potential operation at temperatures beyond present values, it is reported. Possible coolants which might be used in conjunction with a chamber of sintered wire are suggested as the fuel itself (serving double purpose of coolant and fuel), water, air or other suitable gas.
- **Jet engine blades and nozzles.** These porous-wall-cooled units are reported being used in test setups to evaluate Poroloy's transpiration cooling characteristics in various permabilities.

Possibility exists here of including within the blade shell a stiffening rib (attached to the blade root) for carrying the load, merely using the porous blade for the aerodynamic and thermodynamic characteristics.

- **Heat barriers** for passing ram air to protect equipment from adjacent heat.
- **Magnetic filter** for protecting against


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# Now... another Cutler-Hammer "first" for Aircraft Designers

**These new Cutler-Hammer One Hole Mounting Lever Lock Switches are available in constructions to prevent inadvertent operation from any lever position to any other lever position. Intentional operation of the switch is accomplished by a pull on the lever to unlock it and permit its movement to the desired position.**

## *One Hole Mounting Lever Lock Switches*

Cutler-Hammer now offers the first line of Lever Lock Switches ever engineered for one hole mounting. Lever Lock to prevent accidental operation *without* cumbersome switch guards that obstruct panel visibility. One Hole Mounting to conserve panel space and provide maximum areas for panel markings.

These are typical Cutler-Hammer Aircraft Switches . . . top-quality construction, expertly engineered. Positive snap action with dependable contact pressure in the closed position and reliably secure contacts in the open position even under the severe shock and vibration encountered in combat aircraft service. The lever seal is of special silicone rubber, engineered to outlast the operational life of the switch. The seal is unaffected by ozone or sunlight, oil or water, or extreme temperatures, either high or low.

Cutler-Hammer Lever Lock One Hole Mounting Aircraft Switches are available in single, double or four-pole constructions . . . single or double throw, with or without center "off" position. Designed for minimum parts and weight. They solve many aircraft design problems. Be sure you have complete data *now*. Write or wire today. CUTLER-HAMMER, Inc., 1471 St. Paul Ave., Milwaukee 1, Wisconsin.

## *What you should know about Cutler-Hammer*

Cutler-Hammer has long held the respect of the aircraft industry because this company has been *part* of the aircraft industry for 35 years. It has never been an opportunist supplier. It has *pioneered* the designs others have followed. It has sought to serve, not merely sell. It has been in the forefront of all cooperative activity in standardization and long-range planning. It has supplied complete lines of equipment, not merely the items of widest use and most profitable manufacture. Today, as for the decades past, Cutler-Hammer engineers are working closely with the aircraft industry's leaders . . . thinking ahead, planning, designing and building for the future. Here is the record:

**1920** Cutler-Hammer designed and manufactured the first line of switches ever created specifically for use in aircraft.

**1938** Cutler-Hammer designed and manufactured the first d-c power relays ever created specifically for use in aircraft.

**1943** Cutler-Hammer designed and manufactured the first a-c power relays ever created specifically for use in aircraft.

**1949** Cutler-Hammer started development of the first environment-free power relays for use in aircraft.

**1953** Cutler-Hammer submitted samples and certified test reports on the first hermetically sealed power relay to WADC and Bu. Aer. Cutler-Hammer configuration was adopted as industry standard by ASG.

**1955** Cutler-Hammer designed and manufactured the first one hole mounting Lever Lock aircraft switches.

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3) Checks thermocouples within the harness for continuity.

4) Checks thermocouples *and* paralleling harness for accuracy.

5) Checks resistance of the EGT circuit *without the EGT Indicator.*

6) Checks insulation of the EGT circuit for shorts to ground and for shorts between leads.

7) Checks EGT Indicators (in or out of aircraft).

8) Checks EGT system with engine removed from aircraft (in production line or overhaul shop).

9) Checks aircraft TACHOMETER system accuracy to within ±0.1% between 95% to 102% RPM.

10) JETCAL ANALYZER enables engine adjustment to proper relationship between engine temperature and engine RPM for maximum thrust and efficiency during engine run. (Tabbing or Micing).

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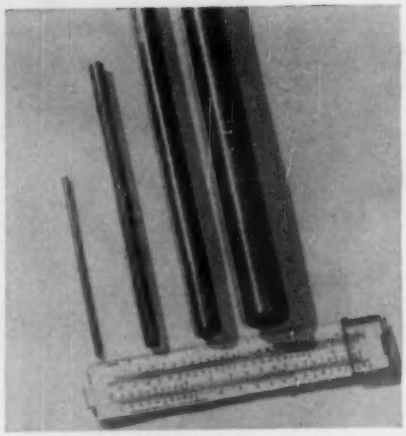


**SEAMLESS POROLOY** tubing could be used for such things as line filtration, fuel atomization or gas dispersion.

magnetic particles in hydraulic system.

• **Boundary layer bleed surfaces** for reduction of turbulence and shock wave formation in region of air intakes on high speed aircraft.

One advantage of the material in this application would be its ability to be formed to compound curvature.

Other possible boundary layer applications include wing leading edges, aft sections preceding the trailing edges, and flap leading edges.

Surface smoothness of the sheet would vary directly with relative density and indirectly with wire diameter.

A Poroloy 10-micron filter element is under development for hydraulic system service, to withstand high temperatures generated by environmental conditions. Aimed at overcoming the temperature limitations of paper filter elements now used, the unit is planned for all-stainless-steel makeup projected to meet AN-6235 specs.

While no definite development has been begun for a thrust-reverser application, the material could be used in an air-cooled blade form to deflect the exhaust gas stream.

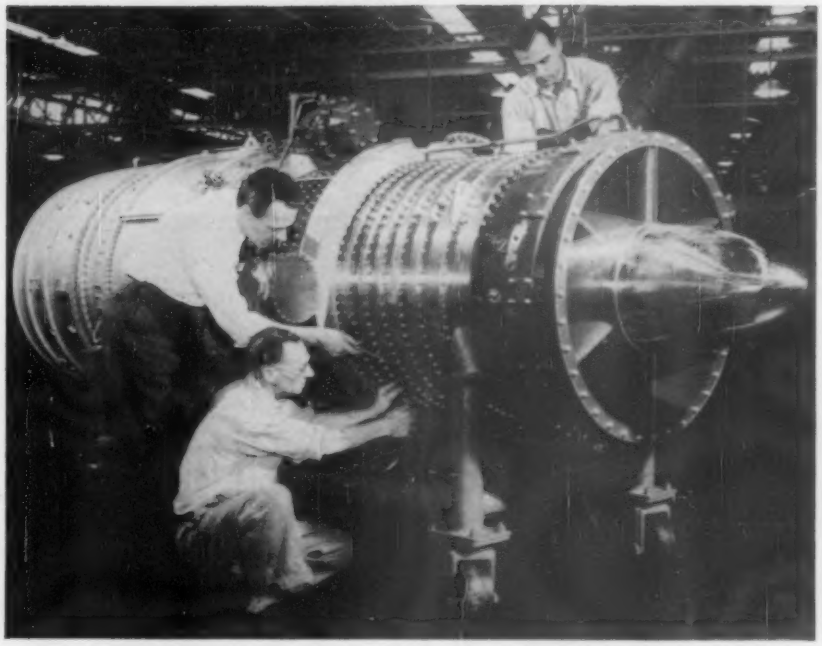
The company also is working on classified projects for such organizations as Redstone Arsenal, Springfield Armory, Office of Naval Research, and National Advisory Committee for Aeronautics.

### Poroloy Properties

In contrast to sintered powder porous metals, the company says, Poroloy has a higher strength for a given permeability because of its wire construction; also has a higher ductility because the continuous strands of fine wire help carry applied loads.

Strength of the structure is closely related to the wire cross-over angle. When Poroloy's strands cross at 90 deg., the material exhibits a uniform strength in all directions.

If the included cross-over angles are



**P&WA Prepares J57 for Smithsonian**

**First experimental model of Pratt & Whitney Aircraft's J57 turbojet engine gets final adjustments before it was shipped to the Smithsonian Institution in Washington for permanent display in the National Air Museum. Built in 1948, this design is a forerunner of the J57 that won the Collier Trophy two years ago. P&WA has two other engines in the Smithsonian: the original nine-cylinder Wasp, designed in 1925, and one of four 28-cylinder Wasp Major engines from the B-50 Lucky Lady II.**

changed to an acute and an obtuse angle, say 35 deg. and 145 deg., the strength will increase in the direction of the line bisecting the small angle and decrease in the direction perpendicular to that line. Therefore, materials with different ratios between maximum strengths can be produced.

Strength also is related to other factors such as the basic metal, degree of cold work and type of pattern.

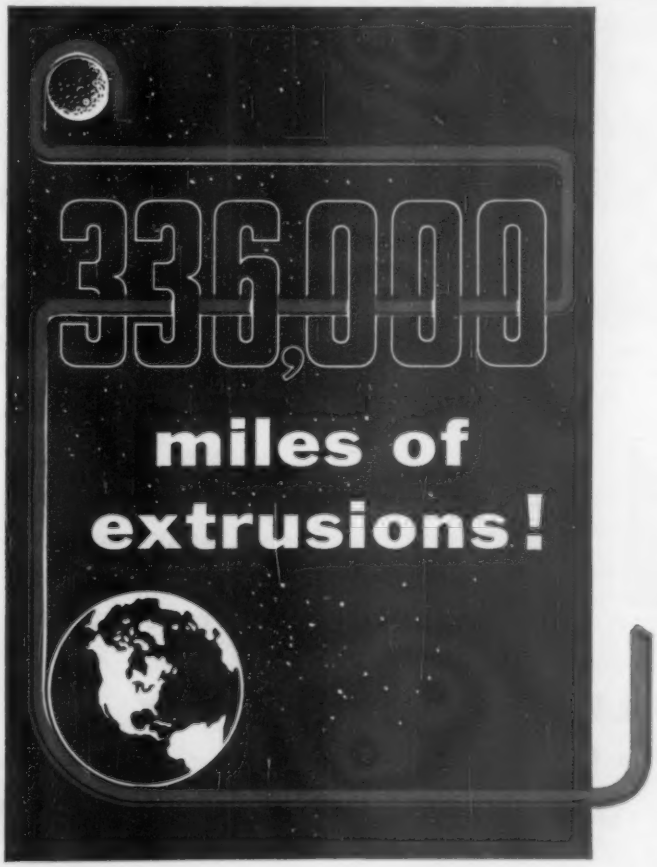
Choice of pore path depends largely on the use of the end product, the company reports. Strength, entry direction, flow rate, pressure drop and filtering ability are factors to be considered in selecting the pore path. Pore configurations include straight-through, angular, and ziz-zag.

## Scrap Used for Dies

Savings of $100,000 annually in die manufacture using melted down aluminum chips as the foundation for large dies instead of zinc alloy Kirksite are reported possible by Lockheed Aircraft Corp., Burbank, Calif.

The plane-maker gives these two reasons: bulk metal cost is less and less metal is needed.

Other advantage include lighter tools and better adhesion when the reclaimed scrap aluminum is used with epoxy plastic facing.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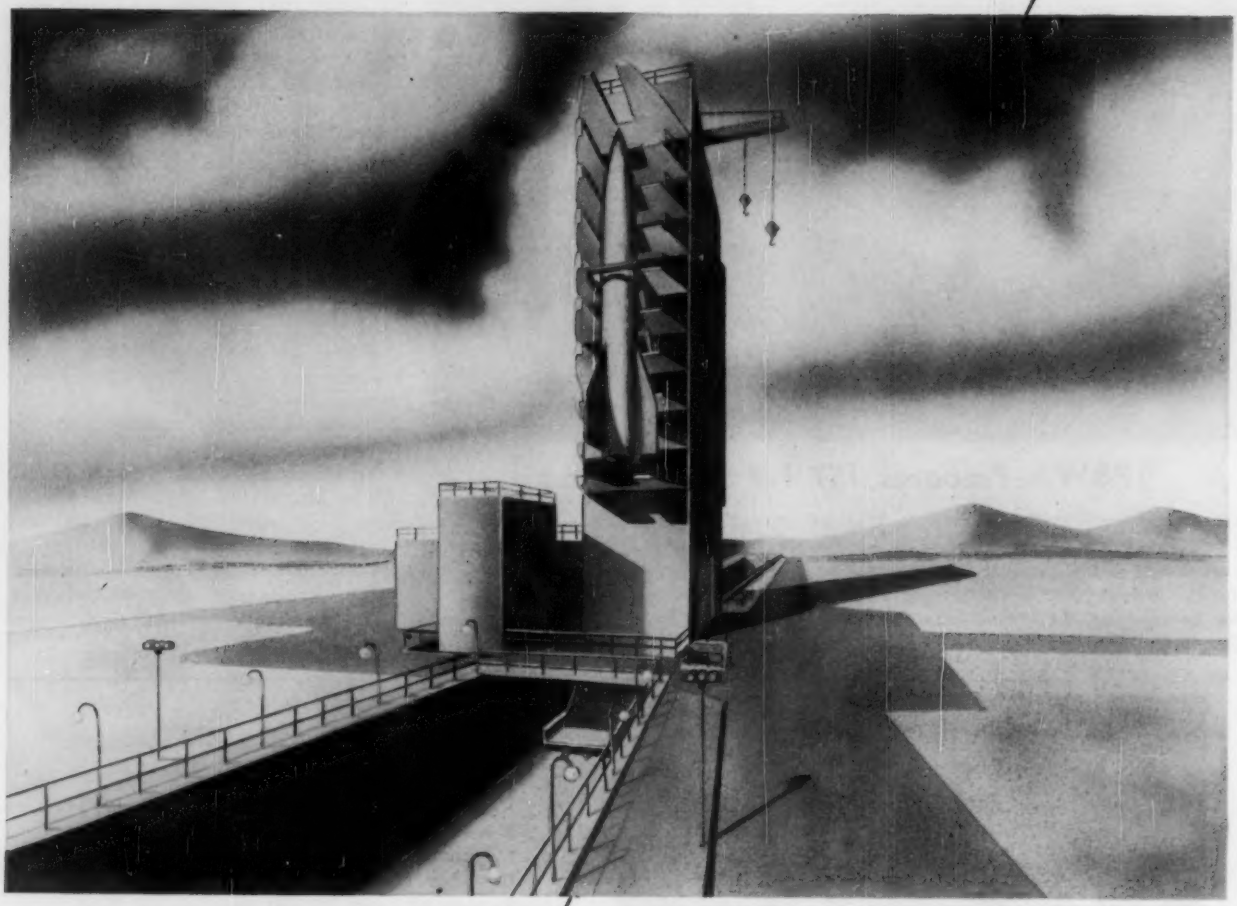
PRODUCTION BRIEFING

## *from Conception to Construction...*



# *complete missile facilities*

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ARCHITECT-ENGINEERING DIVISION

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## PRODUCTION BRIEFING

▶ **Douglas-Santa Monica,** has named C. Itoh & Co., Ltd., Osaka and Tokyo, as its commercial sales representative within Japan. Itoh will do a preliminary marketing survey and investigate sales possibilities for Douglas commercial aircraft and parts. The firm also represents Douglas military products in Japan.

▶ **Lockheed Aircraft Corp.'s** Georgia Division, Marietta, has awarded a contract to Wheland Co., Chattanooga, Tenn., to produce C-130A wing flap track rib assemblies . . . **Lockheed-Marietta** has received an order from Sikorsky Aircraft to make copter fabrication and subassembly tools.

▶ **Goodyear Aircraft Corp.,** Akron, is constructing a $3-million engineering and research building scheduled for occupancy by next summer. Modernization and improvement of other Goodyear aviation facilities is also planned.

▶ **Garrett Corp.,** Los Angeles, has named new foreign sales representatives: Nippon Machinery Trading Co., Ltd., Tokyo, and Sociedad Anonima Olabour, Barcelona.

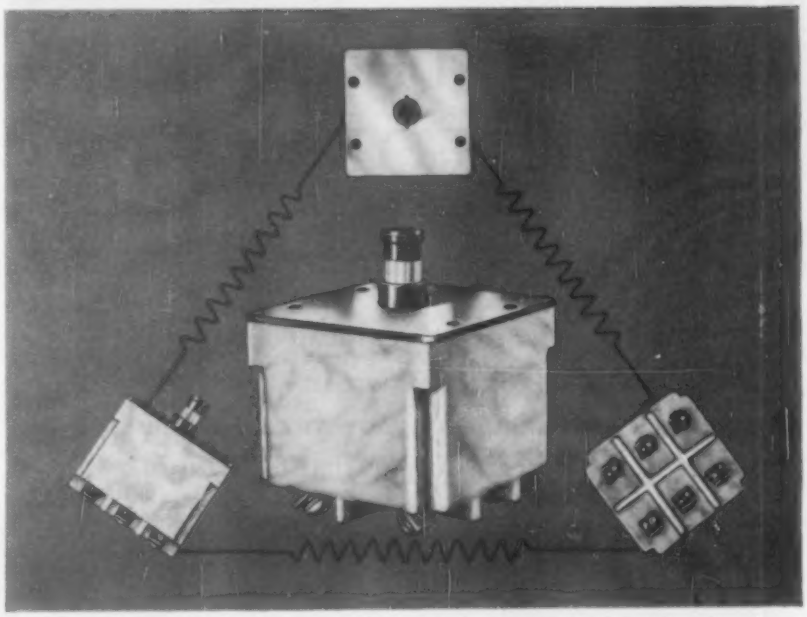
▶ **Koppers Co., Inc.,** Pittsburgh, has purchased Kuchler-Huhn Co., Inc., Philadelphia, maker of mechanical seals for gas turbine rotating shafts. The acquisition will be operated as a department of Koppers Metal Products Division, Baltimore.

▶ **Propulsion Research Corp.,** Santa Monica, Calif., has received a $200,000 contract from Douglas Aircraft Co. for air-driven fuel transfer pumps.

▶ **Servomechanisms, Inc.,** has moved executive offices from Garden City, N. Y., to its Eastern Division, Post & Stewart Aves., Westbury, N. Y. and Western Division, 12500 Aviation Blvd., Hawthorne, Calif.

▶ **Mobay Chemical Co.,** St. Louis, plans full-scale production in October of isocyanate chemicals used in production of urethanes such as flexible and rigid foamed plastics, wire coatings, paints, synthetic rubbers and adhesives. The firm is building a plant at New Martinsville, W. Va., to turn out the chemicals.

▶ **Minnesota Electronics Corp.,** a subsidiary of Librascope, Inc., has moved to 133 E. Santa Anita Ave., Burbank, Calif., from St. Paul, Minn.



Here is a new thermal-type polyphase circuit breaker-(D-6760) for aircraft, embodying three electrically separate, hi-rupture mechanisms with these outstanding features:

1. *KLIXON SIMUL-TRIP* overload tripping action* . . . overload in any one or more phases will trip all three mechanisms simultaneously.

2. *Single button reset* . . . recloses all three phases simultaneously with one button manual operation.

3. *Famous KLIXON flight tested trip mechanism* . . . plus *NEW* 1 to 2 millisecond trip time on short circuit interruption.

4. *Designed for top performance* . . . like its MS25005 and MS25017 predecessors, this breaker is expected to meet MIL-C-5809 requirements.

5. *Thermal type, naturally* . . . to help minimum weight aircraft circuits deliver maximum safe power at *service altitudes,* with full protection on the ground.

This breaker is now being tooled for production in ratings from 3 through 35 amperes. Send for advance technical bulletin — KLIXON—the original aircraft circuit breaker.

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Chula Vista, California
9 miles south of San Diego on sunny San Diego Bay.

# WHO'S WHERE

(*Continued from p. 9*)

## Changes

**Kent M. Campbell,** assistant manager, Dayton office, Convair Division, General Dynamics Corp.

**Vernon R. Degner,** section engineer, Barry Controls, Inc., Watertown, Mass.

**Charles F. Barclay,** customer relations representative, Fairchild Engine & Airplane Corp., Hagerstown, Md.

**Robert J. Dupont,** midwestern district manager, Air France.

**Col. Homer C. Munson,** chief of quality control, Oklahoma City Air Materiel Area, Tinker AFB.

**George H. Buchner,** director of contracts and spare parts, Northrop Aircraft, Inc., Hawthorne, Calif.

**Sam S. Nadelmann,** U. S. passenger traffic and sales manager, Swissair. **Bertrand Jaquiery,** operations manager, Swissair, N. Y. International Airport.

**Clyde O. Benscoter,** purchasing agent, Lockheed Aircraft Service-International, N. Y. International Airport.

**Robert P. Gira,** sales manager, Topp Industries, Inc., Los Angeles, Calif., electronics and hydraulics firm.

**W. A. Mecca,** general sales manager of DuAir Screw Corp., Gardena, Calif.

**Ralph F. Link,** member of Air Transport Assn.'s Air Navigation Control Division. Link formerly was deputy chief of operations for Civil Aeronautics Administration in New York.

**Arthur T. Cartier,** public relations director for Central Airlines.

**Felix A. Chardon,** manager of aircraft quality control for Kaiser Metal Products, Inc., Bristol, Pa.

**G. C. Riordan,** manager of reservations and ticket offices for Trans World Airlines.

**Otis R. Lail, Jr.,** airport lighting representative for Sylvania Electric Products, Inc., New York.

**E. Vernon Jaramillo,** project engineer for aircraft jet fuel nozzles, Delavan Manufacturing Co., West Des Moines, Iowa.

**Raymond H. Williams,** aviation sales engineer for Dunlop Tire & Rubber Corp., Buffalo, N. Y.

**Rudolph Furrer,** vice president-manufacturing and engineering of ACF Industries, Inc., New York, and president of the Nuclear Energy Products Division.

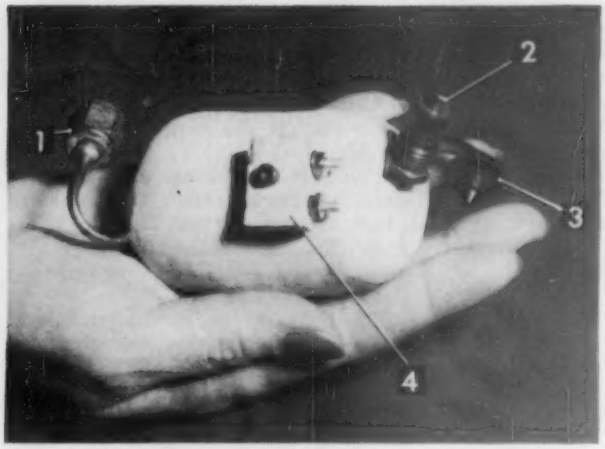
**James A. Stadler,** vice president-general manager of Ozone Metal Products Corp., Ozone Park, N. Y. Other changes: **Edmund D. Holland,** vice president; **John F. Ceccarelli,** landing gear engineer.

**Henry H. Lentzner,** vice president-manufacturing, and **Renald F. Zemke,** works manager of Kearney & Trecker Corp., Milwaukee.

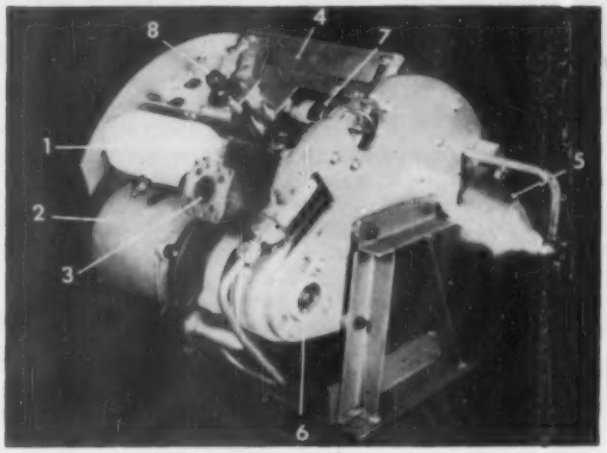
**Daniel J. Fink,** chief project engineer and **Maurice Gertel,** project engineer, Allied Research Associates, Boston, Mass.

**Martin W. Taylor,** assistant maintenance superintendent, Pan American World Airways, Brownsville, Tex., customer service base, a newly created post.

**Grant A. Kettles,** executive staff and director of flight operations, Abrams Aerial Survey Corp., Lansing, Mich.




**REACTION CHAMBER,** where liquid-propellant decomposes, is heart of American Machine & Foundry power unit. 1. Feed line, 2. Turbine supersonic nozzle, 3. Chamber pressure tap, 4. Igniter connector. Chamber measures about 2-in. diameter by 5-in. long.




**MODEL 41** electric-hydraulic power unit: 1. Reaction chamber, 2. Alternator, 3. Exhaust gas port, 4. Magnetic amplifier speed control, 5. Propellant tank, 6. Hydraulic pump drive, 7. Pneumatic regulator, 8. Compressed air regulator for checking out the unit.

# New Power Packages for Missiles

A new line of guided missile accessories is in pilot or prototype production in the shops of a newcomer in the field—American Machine & Foundry Co.'s Turbo Engineering department.

The organization was set up by AMF to specialize in research and development of compact, high-output combustion devices, hot air turbomachinery and other equipment related to guided missile accessory power supplies.

The company already is associated with Radio Corporation of America in the development of a new air defense missile seen as a Nike replacement (AW March 28, p. 11), and currently produces missile test and ground equipment.

AMF set up the new division in Pacoima, Calif., in the latter part of 1953. Today, four different guided missile power packages are either in pilot or prototype production.

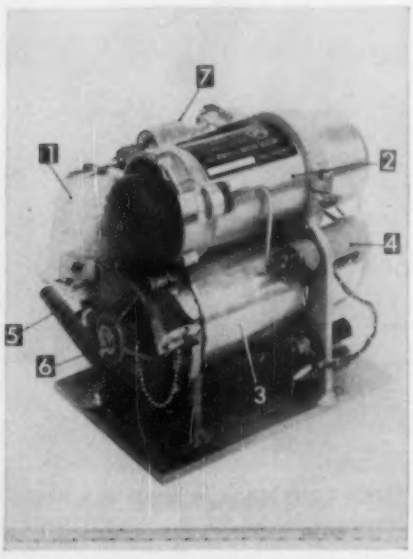
The devices are high-output gas turbines, driven by small rocket motors which provide shaft power to drive alternators and hydraulic pumps.

Current power packages are in the 1 to 10 hp. range. AMF is working on a 35-hp. unit and "future plans encompass units of much larger horsepower and much better fuel economy," according to J. Golden, director of the Turbo Engineering department.

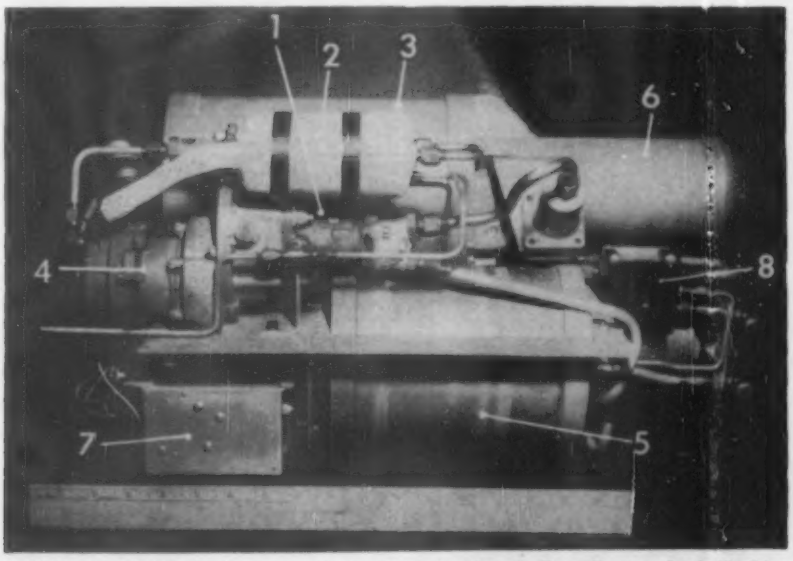
### Hydraulic-Electric Package

The first accessory power unit, Model 25, is now in pilot production. It is a complete guided missile power system capable of supplying either hydraulic or electrical energy. It is approximately 8 in. long, will fit into a 6-in.-diameter tube and weighs 12 lb., including fuel and hydraulic fluid.

Crammed into the cylinder are the gas turbine prime mover, its tankage and pumping plant—in this instance merely the regulated output of a high




**MODEL 200:** 1. Chamber, 2. Propellant tank, 3. Alternator, 4. Pneumatic regulator, 5. Exhaust, 6. Turbine, 7. Propellant control.




**MODEL 171:** 1. Hydraulic pump, 2. Reaction chamber, 3. Propellant tank, 4. Turbine assembly, 5. Hydraulic sump, 6. Hydraulic propellant pump, 7. Magnetic amplifier speed control, and 8. Hydraulic regulator. Unit weighs 69 lb.

pressure nitrogen bottle—regulation devices, start-stop switches, as well as all the appurtenances of a hydraulic system—positive displacement hydraulic pump, high and low pressure hydraulic tanks, etc.

A 4:1 gear box reduces the 48,000 rpm. turbine shaft speed to 12,000 rpm. for the hydraulic pump.

Propellant tank fuel duration is 44 seconds, of which half is full power delivery. The 12,000 rpm. hydraulic pump delivers 0.6 gpm. at 3,000 psi.

Turbine speed control is held within 2½% under a wide range of loads.

The environment-free, completely regulated package also contains conversion equipment for various electrical power outputs.

### All-Hydraulic Unit

A prototype for a larger all-hydraulic power package has been built by Turbo Engineering. Called Model 171, the unit demonstrates weight saving made possible by using a hot-gas machine instead of a static type of power source such as an accumulator.

This AMF package weighs a total of 69 lb., including propellant and hydraulic fluid. The accumulator it replaces weighs 175 lb. The power pack delivers 12 gal. of oil vs. 3 gal. for the accumulator.

The power package is approximately 12 in. square and 30 in. deep. Output is 2 gpm. at 3,000 psi. Duration: 6 min.

### Space-Limited Unit

AMF has another electro-hydraulic power package also in prototype form—the Model 41.

The unit is made up of two cylindrical structures about 15 in. long which together occupy 170 deg. of a 16-in.-diameter circle, indicating the severe design conditions imposed on this type of equipment.

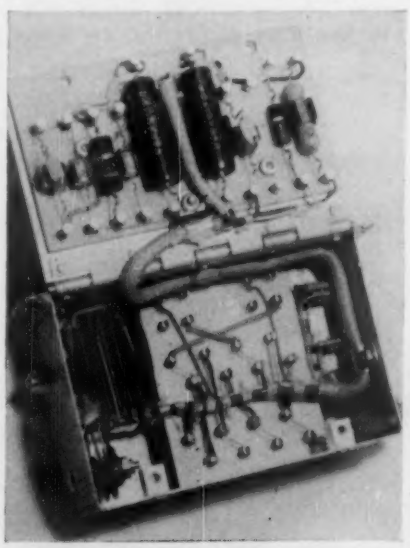
One container houses the propellant and pressurizing gas tank, the other the rotary assembly. The latter is a 400-cycle, 1,700-va. permanent magnet-type alternator (weight is 12 lb.) directly connected to a 4¼-in.-diameter turbine operating at 24,000 rpm. In addition, a 4:1 epicyclic gear train drives a hydraulic pump at 6,000 rpm. providing a hydraulic output of 2½ hp.

Golden points out that packaging and space limitations dictated turbine's outside diameter, while simplicity required the alternator to be directly connected to the 24,000-rpm. turbine, giving relatively low turbine efficiency. However, "this is the highest turbine efficiency obtainable under the design conditions imposed and which would meet the overall package weight requirements," Golden says. Power pack weighs 36 lb. dry and 39 lb. wet.

### Dual Electrical Unit

The fourth power supply—also a prototype—is a composite electrical system.

Dual output is 4,000-cps. power for miniaturized mechanical servo systems,

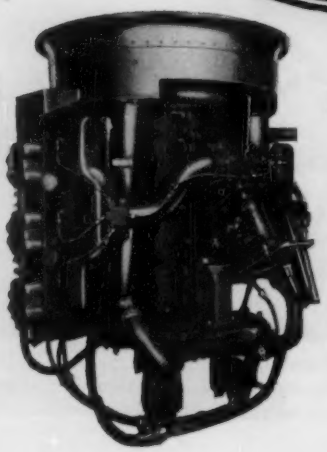


**SPEED CONTROL** is by means of a simple demand-modulated system. Magnetic amplifier discriminator circuit is used in conjunction with a solenoid valve which controls propellant flow and flow of hot gas from the generator. Unit has no relays or tubes.

4 out of 5

helicopters under 400 hp. produced this year will have power by

Franklin
FINE AIRCRAFT ENGINES



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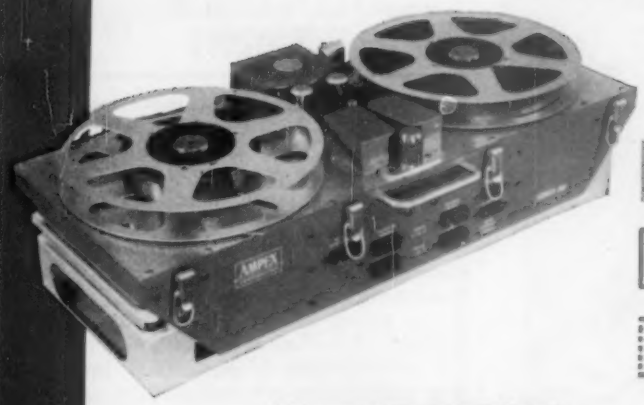
**THE AIRBORNE AMPEX 800 records the broadest combination of data ever obtained concurrently on one magnetic tape—performs under all high altitude environmental conditions—and furnishes data compatible with the most widely used playback equipment.**

## HANDLES ANY AIRBORNE DATA REQUIREMENT

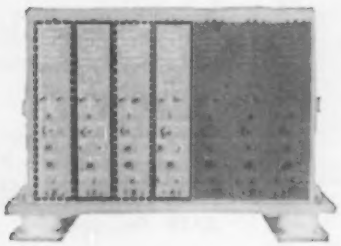


The Ampex 800 can provide from 1 to 28 data channels. By interchangeable amplifier units, each one can be adapted to any one of three basic magnetic recording techniques:

**Direct recording** — 300 to 35,000-cycle response for a wide-band data or multiple recording of RDB subcarriers.

**FM-carrier type recording** — D.C. to 5000 cycles and high instantaneous accuracy suitable for shock and vibration data.

**Pulse-width modulation recording** — Up to 30 instrument readings commutated on to each tape track; frequency response 0 to 2 cycles/sec.



Combinations of these recording techniques can be provided to satisfy practically any flight test requirement by simple insertion of the proper plug-in amplifiers. Separate channels can be assigned to measurements requiring wide-band response or high transient accuracy. By using pulse-width techniques, many relatively steady instrument readings can be commutated on to a single channel. All will have a common time base.

## WITHSTANDS THE RIGORS OF HIGH ALTITUDE FLIGHT

The Ampex 800 will perform within specifications under vibrational forces as high as 10G — operates over a temperature range from —65° F. to +130° F. — is unaffected by altitudes to 50,000 feet — and withstands a relative humidity of 100% up to 122° F. The Ampex 800 is light in weight. It operates on 27.5 volts D.C. and 115 volt, 400 cycle, A.C. All operating functions can be remotely controlled.

## RETAINS WIDELY ESTABLISHED RECORDER STANDARDS

The majority of all magnetic recorders now in instrumentation use are Ampex machines. Their recording characteristics, tape speeds, track widths and other parameters have become a standard in aircraft and missile testing. The Ampex 800 retains these standards while greatly extending the environmental and mechanical conditions under which accurate test data can be gathered.

*Performance specifications, descriptions and explanations have necessarily been limited by the space on this page. A full description and detailed specifications on the Ampex 800 are available by writing Dept. UU-2243*

*First in Magnetic Tape Instrumentation*

**BRANCH OFFICES:** New York; Chicago; Atlanta; San Francisco; Dayton; College Park, Maryland (Washington D.C. area)

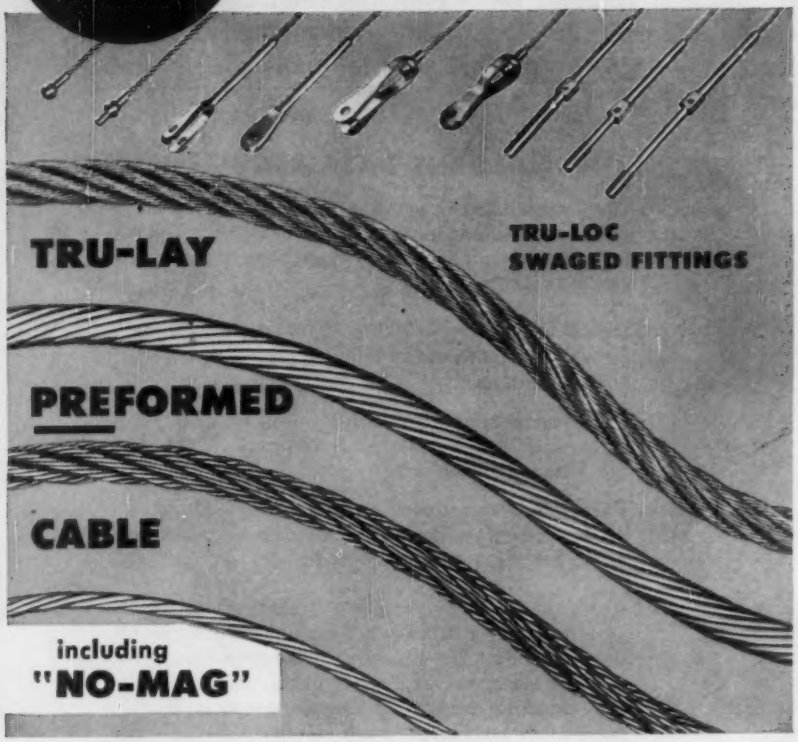
AMPEX CORPORATION

REDWOOD CITY, CALIFORNIA

INSTRUMENTATION: Radio Shack, Boston; Ring Electronics, Los Angeles; Instrument Engineering & Equipment, Dallas and Houston; Canadian General Electric Company, Canada

ACCO products

# TRU-LAY Cables TRU-LOC Fittings




## Solving Aircraft Design Problems...

is an old story to ACCO. The originators of preformed cable and swaged terminals for aircraft use, ACCO engineers have now introduced new non-magnetic aircraft cables. The complete line of ACCO cables and fittings now includes . . .

**New "No-Mag" Cable — ends instrument interference**

New "NO-MAG" Aircraft Cables are made from Type 305 stainless steel. Their advantages include:

- Remain non-magnetic even after severe cold working—eliminate instrument interference through cable magnetism.
- Better corrosion-resistance properties than standard stainless steel cables.
- Thermal expansion characteristics are much closer than standard cable to characteristics of aluminum alloys used in aircraft—this simplifies maintaining cable tension under changing temperatures.
- High fatigue and abrasion resistance.
- Preformed construction.

**TRU-LAY Cable** Provided in all standard stainless and carbon steels in a complete range of sizes and constructions. Because it is preformed it

- Can be cut without seizing.
- Is easier to handle—less tendency to loop or kink.
- Can be installed in less time.
- Is free of tendency to rotate—runs true over sheaves or pulleys—is easier on pulleys.
- Has greatest resistance to bending fatigue—gives longer service.

**TRU-LOC Swaged Fittings**

- Guaranteed to hold to the rated breaking strength of the cable with which used.
- Eliminate costly, uncertain splicing.
- *"Quickies"*—specially developed double-shank ball-type terminals—make it possible to connect and disconnect control sections in an instant without tools.

*Write Detroit office for specifications*

ACCO

**Automotive and Aircraft Division**
**AMERICAN CHAIN & CABLE**

601 Stephenson Building, Detroit 2
2216 S. Garfield Ave., Los Angeles 22 • Bridgeport 2, Conn.

Aircraft Cable • Swaged Fittings


### AMF's Missile Battery

American Machine & Foundry Co. has developed remotely activiated primary reserve batteries for guided missiles. Remote activation—by electrically or mechanically released inert gas or other means—takes place in less than one second.

The small batteries, of silver-zinc design, have a very high discharge rate, unusually flat voltage curve, good weight and volume efficiencies and give stable over-all performance at environmental extremes, the company says.

Batteries were developed at AMF's Raleigh, N. C., laboratories.

and 400-cps. current for conventional gyro and other low-frequency applications.

Unit is driven either by a 24,000-rpm., 400-cps. synchronous electric motor or, when airborne, by a monofuel hot gas-turbine drive. When turbine driven, the 400-cps. motor converts to a synchronous generator.

The power supply, which contains the fuel, all valves, generators, motors and servo amplifiers, produces 3 hp. It is packaged in a cylinder 7½ in. in diameter and 12½ in. long.

Another device, Model 200, in prototype stage, is an all-electrical power supply whose output will be approximately 3,000 watts. The gas turbine prime mover, including tankage for 30 seconds duration, will weigh less than 9 lb.

### AMF Projects

AMF engineers and technicians are pushing their research into several other fields. Among them:

- **Pressure jets.** A hot pressure-jet system is being developed to propel helicopters. Power source is a rocket whose exhaust drives an air compressor through a turbine. Compressor air is mixed with the combustible rocket exhaust and is ejected and burned at rotor blade tips.
- **Flux commutating alternator.** Turbo Engineering has developed a lightweight, high-frequency machine of this type for use at high rpm.
- **Highspeed centrifugal pumps.** Used as rocket fuel system feed pumps, a typical design would turn at 100,000 rpm., produce 800 psi. pressure rise on a relatively small flow (approximately 3 gpm.). Impeller diameter is slightly more than ¼ in.
- **Ram rocket engine.** This device is a rocket combustion chamber located in the center of a duct (like a ramjet) inducing an air flow, then mixing and burning fuel with the air flow. Rocket could also act as flameholder.

Why use hot gas turbine power

## ENGINEERS

*Unusual Positions With Established Flight Research Organization*

### ● Aircraft Structures ENGINEER

Requires minimum 5 years aircraft structural design and stress analysis experience, including prime responsibility for the structural integrity of major air frame components.

### ● FLIGHT TEST ENGINEER

For experimental flight research organization, engaged in the development, installation & flight testing of aircraft instrumentation and flight control equipment. Must be familiar with all operational phases of electrical and mechanical aircraft control systems. Engineering degree or equivalent technical experience required.

SUBMIT RESUME
*Att: Robert Stewart*
OR
PHONE FOR APPOINTMENT
RONKONKOMA 9-8086
(RONKONKOMA, N. Y.)

**. . . SPERRY . . .**
GYROSCOPE COMPANY
*Division of the Sperry Corp.*
P. O. BOX 218
RONKONKOMA, L. I., N. Y.

## AERODYNAMICISTS

★ New subsonic and supersonic projects are creating an urgent demand for aerodynamicists at Northrop Aircraft, Inc., America's first company in the vital development, design and production of all-weather and pilotless aircraft.

★ If your training and experience qualifies you for one of these challenging assignments, please telephone or wire collect:

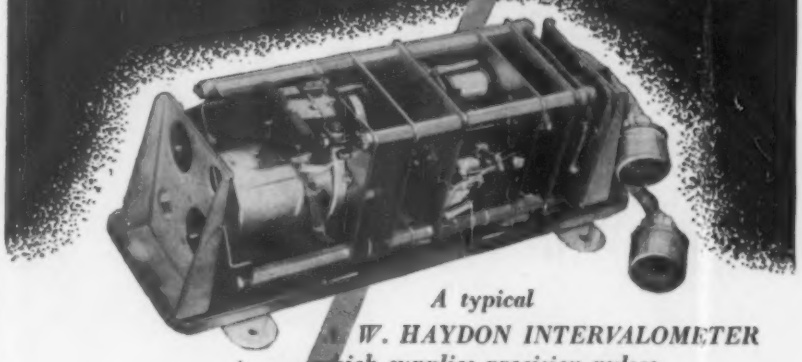
Mr. Robert Ehinger
*Manager of Engineering*
Industrial Relations
Northrop Aircraft, Inc
Hawthorne, California

★ Expense-free Los Angeles interviews will be arranged for qualified applicants.

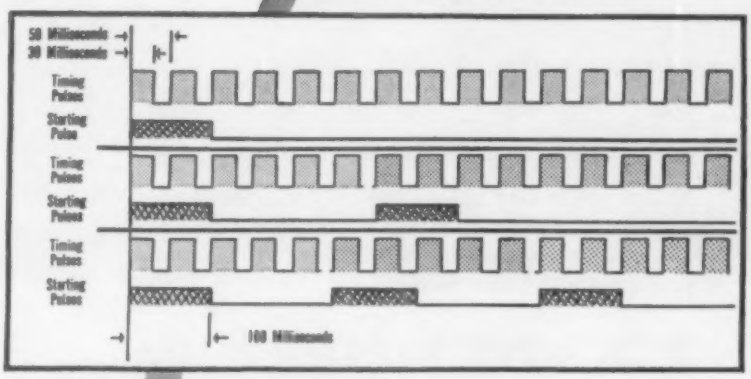
**NORTHROP AIRCRAFT**
INCORPORATED
HAWTHORNE, CALIFORNIA

## *Short Interval Timing Your Problem?*

## A. W. HAYDON CAN HELP YOU.



*A typical*
*A. W. HAYDON INTERVALOMETER*
*which supplies precision pulses*
*as shown on Chart below.*




### *THREE TYPES OF OPERATION*

The operator adjusts a selector switch to determine the type of operation.

**OPTION #1.** When a starting pulse of 100 Milliseconds is applied, this Intervalometer starts up and energizes 15 Pulsing Circuits at 50 Millisecond intervals. Each circuit is on for 30 Milliseconds. At the end of the period, the unit automatically resets to the starting position.

**OPTION #2.** When a starting Pulse of 100 Milliseconds is applied, this Intervalometer starts up and energizes 6 Pulsing Circuits, then shuts down. When the next starting pulse is applied, the balance of 9 pulsing Circuits are energized. The unit then resets to the starting position.

**OPTION #3.** When 1st starting Pulse is applied 5 Pulsing Circuits are energized. When 2nd starting Pulse is applied next 5 circuits are energized. When 3rd starting Pulse is applied next 5 circuits are energized.

*Write for General CATALOG or Submit Detailed Problem Statement.*

*The* **A. W. HAYDON *Company***
222 NORTH ELM STREET, WATERBURY 20, CONNECTICUT

Design and Manufacture of Electro-Mechanical Timing Devices

AN OLD PROVERB:

"He loses all...

who loses
the right moment"

This is a good time to consider whether or not the moment has come for you to make the change in your employment that can mean the beginning of a successful, productive and happy future.

Opportunities are outstanding right now at Fairchild Aircraft Division, for experienced aerodynamists and designers looking for interesting, provocative work in the forefront of aviation design, research and development.

Take stock of your present job. See whether you wouldn't rather have the kind of progressive, active and interesting job that Fairchild is offering to the right men.

Send your resume today to Walter Tydon, Chief Engineer.

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Aircraft Division
HAGERSTOWN, MARYLAND

"where the future is measured in light-years"

sources for guided missiles? Turbo Engineering believes that for many applications the hot gas turbine machine betters other possible power sources in these important parameters: it is lighter, smaller, and its output is easier to control to the precise tolerances required by guided missile electrical and hydraulic systems.

Other possible sources of accessory power for guided missiles include:

• **Main propulsion engine,** if it has a rotating shaft. The company says recent developments indicate that future needs for accessory power will require closer regulation than it is possible to obtain from the rotation of the prime propulsion shaft unless "extraordinarily high weight and space penalties are paid" by main-engine speed regulating drives.

• **Static devices,** such as electric batteries or hydraulic accumulators. (In the strict sense of the word, an accumulator moves in a one-shot missile system, but AMF classifies the accumulator with the battery as a static device for convenience).

These systems are quite reliable, says AMF, but they tend to be heavy.

• **Bleed air turbine,** which uses air bled from the main propulsion engine's compressor section. This source of accessory power is simple and reliable.

Disadvantages are that turbines have to operate under a wide range of pressure and density ratios, creating throttling problems. Units have to be large to produce desired output at high altitudes. Also, bleed air turbines penalize turbojet engines by stealing compressor air, thus increasing jet's fuel consumption.

• **Ram air turbine,** which uses the ram air pressure around an airborne missile as a driving power source. Although relatively simple and very efficient under certain circumstances, air turbines often present two disadvantages. Because a missile may take off at slow speeds in high-density air, fly at high speeds in very rarefied air and descend at high speeds in increasingly dense air, the dynamic head through which the turbine must travel varies tremendously—as much as several hundred to one. Yet, the missile's electrical and/or hydraulic systems require precise power output regulation—possibly as tight as ¼%. Result is that control problems become extremely complex. AMF says that the throttling problem is becoming a critical limitation of air turbines used as guided missile power sources.

Second drawback is that the "weight" of the turbine includes not only the machine itself, but also extra fuel needed to offset drag created by turbine and its ducting during the missile's takeoff and flight.

• **Hot gas turbines,** says AMF, provide an ideal solution to the weight prob-

## Emergency Power

**Latest application of Turbo Engineering's rocket-driven accessory power packages is emergency power supply for undisclosed types of piloted aircraft.**

**The hot air turbine machines are used to provide either emergency electrical or hydraulic power or both in case the aircraft's normal systems fail.**

**Sufficient fuel is provided to operate the power packages for at least twenty miutes to enable the pilot to establish communications, navigate with electrically-driven instruments and operate such hydraulic services as lower his landing gear.**

lems usually associated with static power packages and throttling complexities inherent in many air turbine installations.

AMF drives its turbines by liquid monopropellant rockets or gas generators. (Monopropellants are chemically unstable liquids which decompose in a rocket motor, providing hot gases.)

The company uses ethylene oxide which decomposes into methane and carbon monoxide, both of which are combustible and can be burned with an oxidizer. Some AMF units derive their power from the decomposition products of propyl nitrates and other alkyl nitrates which usually decompose into fuel-rich gases.

Gases are not burned in AMF's missile power supplies which use ethylene oxide.

Instead, the monopropellant decomposition occurs under high pressure to release energy by converting the pressure to velocity in a supersonic nozzle. This high-velocity jet is expanded through the nozzle at velocities of over 5,000 fps. to impinge on buckets, usually of an impulse turbine.

Turbo Engineering says its units are relatively wasteful machines. But, "if maximum available energy were used, a control problem analogous to the air turbine problem would be created. A relatively simple device that is relatively wasteful of energy is to be desired.

"In AMF units, fuel consumption will vary from 6-20 lb./hp. This is quite satisfactory for the limited flight duration of a guided missile. Reasons are that, being environment-free, complicated controls are eliminated; and, although heat is liberated rather wastefully, size of machinery required to utilize its energy is very small."

Other Turbo Engineering activities include participation in classified research in rocket motor combustion and company-sponsored developments on new powerplant cycles.

# AIR RESCUE FOR A WATER-SOAKED PILOT

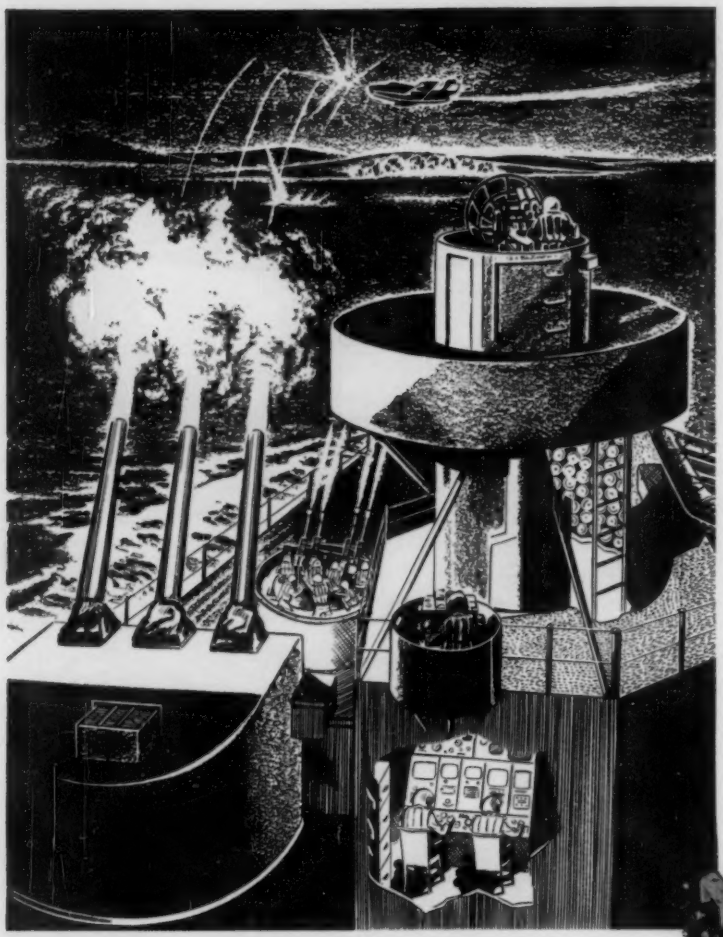
Today, a new *Retriever* flies for the U. S. Navy. It's the new Piasecki HUP-4. Small, compact and highly efficient, the HUP-4 is an advanced version of the HUP-2—the first helicopter designed specifically for the Navy.

Like its popular ancestor, the HUP-4 is another great forward stride in Piasecki helicopter design and development. Hauling "dunked" pilots out of the sea is only one of the many important tasks it will perform for the fleet throughout the world. Its large increase in power results in higher speed, longer range and greater payload.

This is just another outstanding result of Piasecki Helicopter Corporation's increasing effort to improve helicopter performance — build helicopters that do more jobs and do them better than ever before.

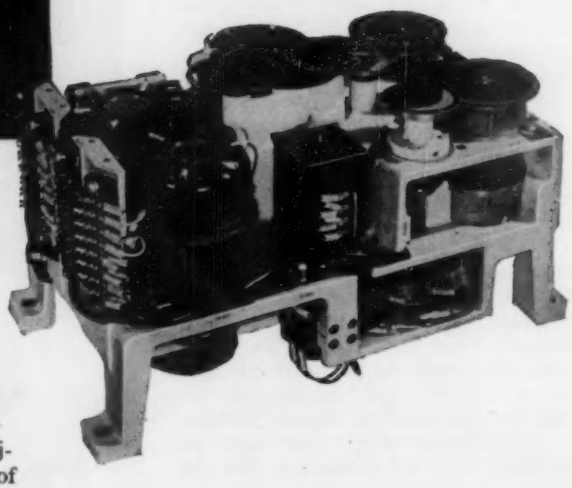
**FIRST IN TANDEM TRANSPORT HELICOPTERS**

Piasecki HELICOPTER CORP. MORTON, PENNSYLVANIA



## Atlas Built Parallax Correcter Helps Keep Guns

# ON TARGET IN ANY SEA



## PRECISIONEERS OF ELECTRO-MECHANICAL ASSEMBLIES FROM PILOT STAGE...ON

Computers, correcters, radar and sonar systems Atlas develops and "precisioneers" assemblies and components for all types of electro-mechanical devices. Furnishes the practical engineering step between the idea and the production line.

Atlas design, production and methods engineers, toolmakers and skilled mechanics are ready to work on your project on a *job basis* . . . as many men, machines and hours of work it requires and no more. Every up-to-the-minute cost cutting tool and technique is utilized. Atlas metallurgical and electronic technicians thoroughly test your product.

From pilot stage to production efficiency of electro-mechanical equipment the leaders rely on Atlas "creative engineering." Atlas Precision Products Co., Philadelphia 24, Pa. (Division of Prudential Industries).

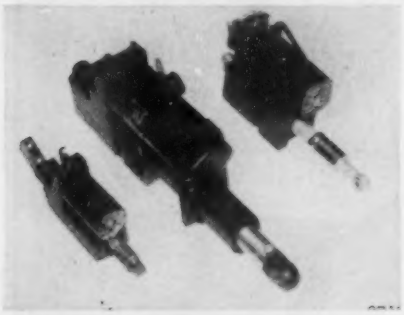
*Write for booklet "Precisioneering Electro-Mechanical Equipment."*

*"From Drawing Board... to Production Line"*

ATLAS
*Precision Products*

ATLAS DEPENDABILITY QUALITY

# NEW AVIATION PRODUCTS



## Actuators for 0-7,000-Lb. Range

Two new thin-package aircraft linear actuators, the 434 and 435, have been designed to operate in the 0-7,000-lb. load range. They complement a 413, initial model in the series.

Typical envelope sizes for the 413, 434 and 435 series, respectively are: 1.8x3.7 in., 2.6x4.9 in., and 3x5 in. Representative weights are 1.7, 5 and 9.9 lb. respectively.

Typical maximum operating loads, maximum static loads and ultimate static strength in tension and compression are, respectively: Series 413—500, 1,300 and 2,000 lb.; Series 434—2,000, 5,000 and 9,000 lb.; and Series 435—7,000, 10,000 and 15,000 lb.

Voltage requirements are standard 26-v. d.c.; 115-v., single-phase, 400-cycle a.c.; or 200-v., three-phase, 400-cycle a.c.

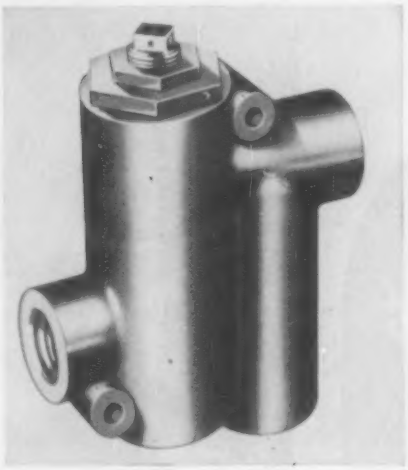
**Lear, Inc., 110 Ionia Ave., N.W., Grand Rapids, Mich.**

## Units Measure Propagation Gain

Parabolas, horns, dipoles and dipole arrays with precision gain calibration to 0.2 db. are available to cover the frequency spectrum from 100 mc. to 50,000 mc. The equipment is designed for laboratory use in determining propagation gain.

Parabolas are used for 2,600-50,000-mc. and gains of 20 db. and over; horns are said to be more useful for lower gains in the same frequency range; dipoles and dipole arrays are provided for frequencies down to 100 mc.

**Color Television, Inc., 913 E. San Carlos Ave., San Carlos, Calif.**



## Relief Valve Has Thermal Venting

To control maximum system oil temperature as well as pressure, Series EA 50004 oil-hydraulic aircraft relief valve features a thermal venting system. Temperature control unit has been added to a 3,000-psi. relief valve as a safety device to prevent fluids from exceeding 270F.

Valve is available for use with ½-in. tubing. Full flow rating is 22 gpm. at 3,700 psi. Relief pressures and temperature settings can be provided to meet required specs.

**Vickers, Inc., 1400 Oakman Blvd., Detroit 32, Mich.**

## Computer for Dead Reckoning

Pocket-size time-interval measuring computer for flight navigation can be used with maps of any scale without intricate calculation or adjustment. It features use of a modified logarithmic cam to convert linear distance as measured on a map into logarithmic increments, permitting any measured distance to be indicated directly on the circular slide rule.

The computer is also arranged to permit calculating wind drift, air miles per gallon, range and true airspeed. Accuracy is said to be approximately 0.5%. Temperature variations produce no noticeable error, it is claimed. Price is $15.

**Time-Interval Measuring Computer, Box 94, Holmes, Pa.**

## Highspeed Mercury Switch

Multi-position highspeed switch utilizes a jet stream of mercury as the pole or wiper arm. No brushes or slip rings are used. Speeds of at least 10,000 rpm. can be achieved and up to 120 circuits per revolution can be sampled, it is claimed.

Noise is said to be less than 10 mv. into 100 ohms. Absence of spring-loaded contacts gives long life with no contact bounce, the maker says.

**Detroit Controls Corp., Research Division, 1650 Broadway, Redwood City, Calif.**

## Stamp Rate Up to 900 a Minute

Wean Flying Press stamps coiled steel strip at production speed of 600-900 strokes per minute. Coil moves continuously, rather than intermittently, and upper and lower dies move forward and synchronize with the speed of the metal strip.

Another feature of the press is that it has neither clutch or brake, items

IF YOU USE

STAINLESS OR HIGH ALLOY TUBING

*this new booklet was written for you...*

Whether you're an engineer who wants technical information in a hurry, or a new user of tubing looking for the full story of stainless and high-alloys, you'll find this booklet equally valuable.

In it, discussed by classification, you'll find data on pressure, sanitary, mechanical, heat-resistant, ornamental and other forms of stainless and high-alloy welded tubing. There are engineering data on joining methods, welding techniques, bending and installation hints. Also included are complete tables of bursting pressures, physical and chemical properties of stainless steels and other alloys, and corrosion and temperature data. This is only a partial list of contents, but it will give you an idea of the wealth of pertinent, factual information the booklet contains.

To get your free copy, just drop us a note on your company letterhead. There is no obligation, of course.

**TRENTWELD**

**STAINLESS STEEL TUBING**

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

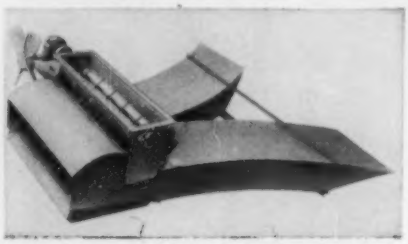
usually accounting for much of the down-time and maintenance on such machines, according to the maker. Energy is stored in the motion of the dies and die-holders, rather than a flywheel.

Units will be manufactured in a range of sizes. Photo on p. 81 shows the 60-ton prototype.

**Wean Equipment Corp., Cleveland, Ohio.**

## Dust Spreader Increases Flow

New airfoil spreader designed for spray/dust agricultural plane operations is stated to increase dust flow 35% over other types. The spreader's airfoil-shaped nose and gate sections provide maximum venturi air pressure and



flow. The four-position gate is adjustable for high, medium or low density material.

In flight tests dispensing 50 lb. of dust, the device gained an indicated airspeed of 87-mph. and 13-second dust flow, in a 300-hp. Lycoming-powered Stearman at 1,900 rpm. and 20-in. Hg constant power setting.

**Transland Co., El Segundo, Calif.**

## New Tools Due For Showing

Three new machine tools have been developed by Pratt & Whitney Division of Niles-Bement-Pond. They are:

• **BL Keller tracer-controlled miller,** BL 3622, Model C, is heavier than previous Keller types and is designed to take larger work. Spindle power is increased to 10 hp. and range of spindle speeds is 30 to 3,600 rpm. in 20 steps. Spindle has either No. 12 B&S or No. 50 mm. taper bore. Horizontal travel is 36 in., vertical travel is 22 in., and traverse travel is 12 in. Work table space is 48x30 in.

• **Velvetrace miller** with 12x9-in. work capacity has control system that does not touch the model and presents no deflection or mechanical motion in the tracer. System is based on a minute spark gap of harmless high-voltage low-amperage current between tracer and model. Variations in the gap produce proportional changes in the voltage across the gap. These changes are electronically amplified and used to control magnetic clutches driving the spindle quill and table movements.

• **Vertical position hole grinder No. 2E**


KEARFOTT FLOATED RATE INTEGRATING GYROS

KEARFOTT 6.05 x 10⁶ FLOATED GYRO

KEARFOTT 2 x 10⁴ FLOATED GYRO

*Consistently Accurate*

Their initial accuracy represented by the random drift is continuously repeated in day-to-day operation.

| ANGULAR MOMENT GM.CM.²/SEC. | MINIMUM DETECTABLE RATE | TYPE OF TORQUER | TORQUER LINEARITY FULL SCALE | CHARACTERISTIC TIME | DIMENSIONS | WEIGHT POUNDS |
|---|---|---|---|---|---|---|
| 6.05 x 10⁶<br>2 x 10⁴ | .01°/hr.<br>4.1°/hr. | A.C.Vane<br>A.C.Vane | 0.17%<br>0.1% | .0035 Sec.<br>.0025 Sec. | 3-3/4" Diam. x 6-1/8" long<br>2" Diam. x 3-7/8" long | 5-1/2<br>1-3/8 |

Kearfott 6.05 x $10^6$ and 2 x $10^4$ Floated Gyros have basic construction features that impart this all-important reliability. The materials used in their construction are of similar coefficient of expansion, thus avoiding mass unbalance due to temperature changes. Displacement information is provided by an extremely linear AC Vane pick-off. Either AC or DC torquers can be provided. Two additional floated rate integrating gyros, one with a 2.5 x $10^6$ gm. cm.²/sec. wheel and the second with a 12.5 x $10^6$ gm. cm.²/sec. wheel are available. Hermetic sealing provides resistance to extreme environmental conditions.

*—Send for Technical Data Sheets*

**KEARFOTT COMPONENTS INCLUDE:**

Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Aircraft Navigational Systems, and other high accuracy mechanical, electrical and electronic components. Send for bulletin giving data of components of interest to you.

**ENGINEERS:**

Many opportunities in the above fields are open. Please write for details today.

Kearfott

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**KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.**

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas
West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

America's most complete line of arc-welding equipment and electrodes.



**AC WELDERS**
Sizes up to 625 amps. All connectable to 220 or 440 volts—550 volts on request.



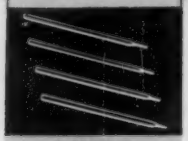
**POSITIONERS**
Capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models.



**AC/DC WELDER**
The first machine to give you either AC or DC current at the flip of a switch.



**DC RECTIFIER WELDER**
Four sizes—200, 300, 400, and 500 amps.



**ELECTRODES**
For mild steel, cast iron, "hard-to-weld" steels, stainless steels, hard surfacing.

Welding aircraft de-icing system with P&H AC/DC welder at Douglas Aircraft Co., Santa Monica, Calif.

# New P&H AC/DC Welder does work of two machines for Douglas Aircraft

*. . . saves time, cuts welding costs, provides new convenience*

The very high temperatures and pressures encountered in jet aircraft de-icing systems posed some new problems for Douglas Aircraft. Instead of aluminum throughout, it was necessary to combine the thinnest gauges of stainless steel and titanium alloy ducts with aluminum sections.

Since AC is required for joining aluminum, and DC for making good welds on titanium and stainless alloys, two separate machines were formerly required at each station. But that was before P&H combination AC/DC machines entered the picture. Here's what a company report says:

"The development of this combination machine has provided better quality, greater convenience, and at the same time lowered our costs for equipment and labor."

Douglas finds that their weldors save minutes per part with these machines—they change from AC to DC and back with the turn of a switch. They have less spoilage and less fatigue. And P&H Dial-lectric control provides instant heat selection and an easy, quick-starting arc.

And you can save money with these versatile AC/DC machines, too. See your nearby P&H representative or distributor or write Welding Division, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

3027

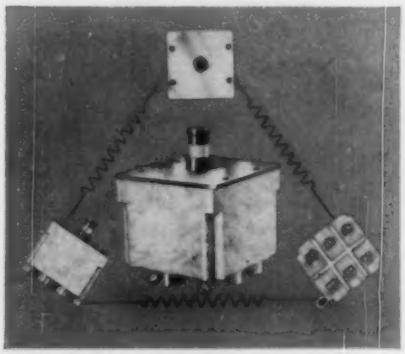
**HARNISCHFEGER**

*the* P&H *line*

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

is designed to grind straight or tapered holes and radiuses. Speeds range from 4,000 to 100,000 rpm. Table work surface is 22x44 in. Work is strapped to the table and does not revolve. Grinding wheel has a planetary motion about the vertical axis of the hole being ground and can be fed outward with an increasingly larger radius while the machine runs. This feature permits accurate locating and grinding of any number of various size holes in a work piece without changing the setup, says the manufacturer.

**Pratt & Whitney Division, Niles-Bement-Pond Co., W. Hartford 1, Conn.**

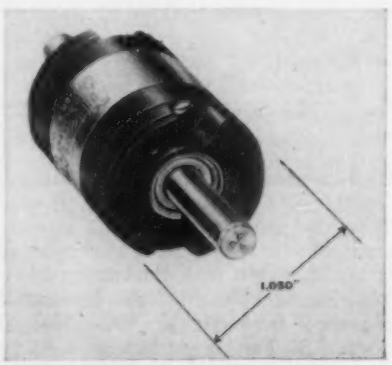


## Three-Trip Circuit Breaker

New Klixon thermal-type polyphase D6760 circuit breaker features three electrically separate high-rupture mechanisms that simultaneously trip should any one of the phases become overloaded.

Single-button reset re-activates all three phases simultaneously and short circuit interruption trip-time takes one to two milliseconds, the maker reports. It is available in ratings of three through 35 amp. The breaker meets MIL-C5809.

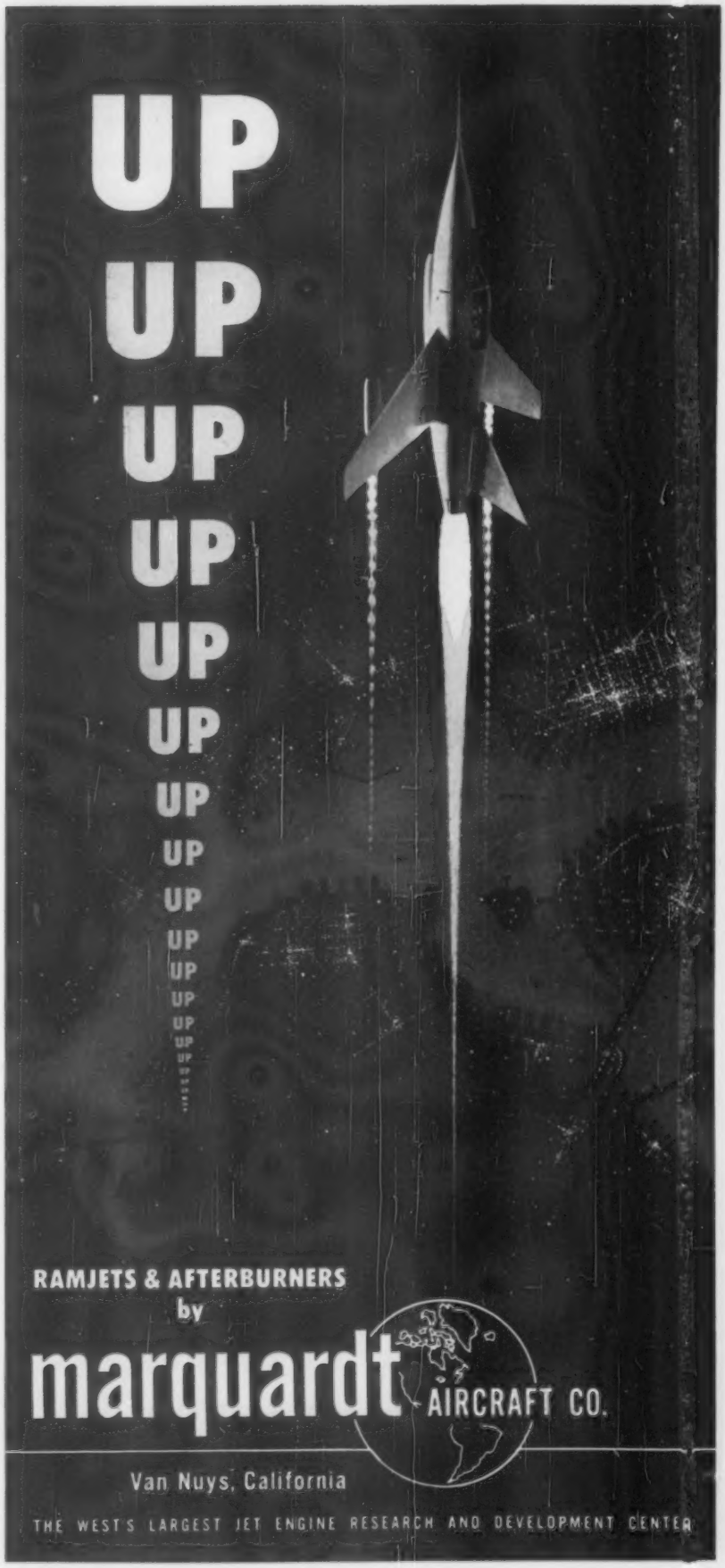
**Spencer Thermostat Division, Metals & Controls Corp., Attleboro, Mass.**




## Speed Reducers Cut Back-Lash

Miniature speed reducers with servo-mount ends have parallel gear trains that are spring-loaded against each other to continuously take up back-lash.

Series 107 units come in 448 differ-

MISSILE

SYSTEMS

PHYSICISTS AND ENGINEERS

■

Research and development in the technology of guided missiles is not confined to any one field of physics. Broad interests and exceptional abilities are required by the participants. Typical areas at Lockheed Missile Systems Division include:

- Applied mathematics such as the numerical solution of physical problems on complex computers
- Analytical systems analysis of guidance and control problems
- Ballistics and the integration of ballistic type missiles with vertical guidance
- RF propagation, microwave and antenna research and development
- Integration of ground and flight test data to evaluate dynamic performance
- Stress and structures
- Instrumentation and telemetering
- Advanced electronics and radar systems

Continuing developments are creating new positions for those capable of significant contributions to the technology of guided missiles.

■

*Lockheed*

MISSILE SYSTEMS DIVISION

*research and engineering staff*

LOCKHEED AIRCRAFT CORPORATION

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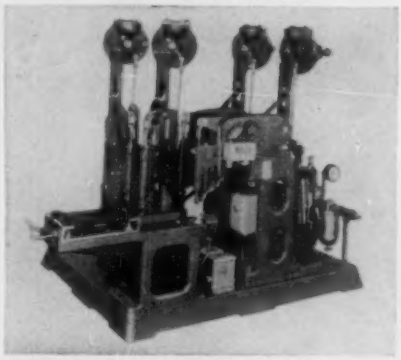
ent standard ratios from 1:1 to 531,-441:1, but special ratios may be obtained. Nominal 1/80-hp. rating is used. Hobbed spur gears are hardened to provide long life.

**Metron Instrument Co., 432 Lincoln St., Denver 3, Colo.**

## ALSO ON THE MARKET



**Multi-head rivet setting machines** come with four and 12 heads. Some set special rivets but by changing the feeding parts, up to 12 rivets of different specs can be set simultaneously.—Tubular Rivet & Stud Co., Wollaston (Quincy) 70, Mass.

**New CM-7 chemical fire extinguishing fluid** has been put on the market. Extinguisher is composed of azeotropic chlormethanes. Maker claims CM-7's qualities are comparable or superior to the overall fire-extinguishing qualities of carbon tetrachloride and chlorobromethane. By-products are nontoxic; CM-7 inhibits formation of phosgene gas and carbon monoxide.—Red Comet, Inc., Red Comet Building, Littleton, Colo.

**Acetrim wire-wound precision potentiometer** trimmers are ½ in. in diameter, have resistance range from 10 ohms to 50K, ambient temperature range of −55C to 125C and weigh 0.25 oz. Units are sealed.—Ace Electronics Associates, 125 Rogers Ave., Somerville, Mass.

**High-capacitance ceramic capacitors** are available in five values from 0.005 mf. to 0.1 mf. and measure ⅜ in. square maximum to ⅝ in. square maximum x ⅝ in. maximum with thicknesses from 0.090 in. to 0.110 in. Items are normally used from 5C to 40C.—Mucon Corp., 9 St. Francis St., Newark 5, N. J.

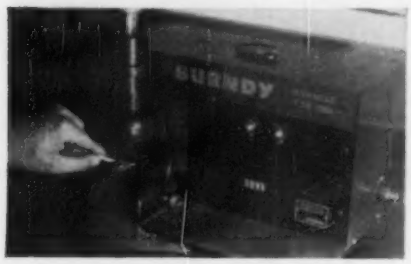
**Regulated power supply units** meet new USAF MIL-E-4158A specs for ground electronic equipment. Fixed power output voltage (adjustable ±25 v.) from 0 to 1,200 v. in these current ranges: 300, 600, or 1,200 ma. Regulation is

said to be held to 0.25% line or load and standard ripple is 4 mv., rms.—NJE Corp., 345 Carnegie Ave., Kenilworth, N. J.

**Stycast 1090 casting resin** has a 0.90 specific gravity when fully cured and is useful from −100F to 400F, the maker reports. Adhesive qualities are said to be excellent.—Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.

**Subminiature relay M-1000** series incorporates a permanent magnet in its electro-magnetic circuit to achieve high armature torques to overcome high contact pressures and actuate large contacts. Balanced armature has no pivots, hinges or bearings. Type M-1000A is a general-purpose SPDT relay and M-1000P is for polarized operation.—Luther Manufacturing Co., 7312 Varna Ave., N. Hollywood, Calif.

**Semi-automatic electric control unit** Y29BUS has been designed for use with Y29BUC sliding-rack-type hydraulic Hypress to indicate that terminal installa-

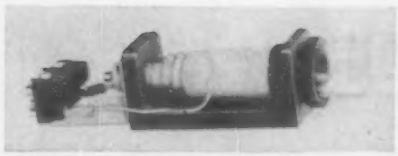



tion is correct. Control prevents Hypress from operating if rack is improperly positioned.—Burndy Engineering Co., Inc., Norwalk, Conn.

**Silicone resins** are available in commercial quantities as dry, crumpled solids for those wishing to formulate protective coatings. Formulas are R-5061 and R-5071, which may be blended to get combinations of good color retention and tough film with less flexible and more thermosetting characteristics.—Dow Corning Corp., Midland, Mich.

**Urethane magnet wire coatings** are said to have higher moisture resistance than other synthetic enamels and need not be stripped before soldering, the maker says.—Mobay Chemical Co., St. Louis 4, Mo.

**Vibration indicator meter** Model 156 has integrating amplifiers and a scale reading amplitudes in thousandths of an inch. Filters can pass rotor-unbalance frequency and eliminate lower frequency shaking of the rig. Two filters of different frequency can be inserted at the same time.—Eastern Precision Resistor Corp., Richmond Hill 18, N. Y.



**Illuminated push-button switch** for aircraft and electronic applications, 31PB1 has low operating force and high pretravel. Overall length is 3⅜ in.—Minneapolis-Honeywell Regulator Co., Micro-Switch Division, Freeport, Ill.

**Motor-generator** of 5 kw., 400-cycles, with rectifier exciter and magnetic amplifier voltage regulator, is built to USAF specs for calibrating, testing or servicing 400-cycle communications, radar and flight control equipment.—Electric Machinery Manufacturing Co., Minneapolis 13, Minn.

**Portable balancing machine** is capable of handling parts at 250 rpm. and is stated to be designed especially for use with large components.—Tinius Olsen Testing Machine Co., Willow Grove, Pa.

**Thermistor-compensated pyrometer** have screw adjuster for setting accuracy within 1% and 17 standard temperatures ranges covering −400F to 3,000F with corresponding Centigrade shown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## NEW LETOURNEAU AIR TOW

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Four powerful electric wheels that drive, steer and brake enable the operator to apply maximum traction so smoothly it's hard to tell when the LeTourneau Air Tow starts to move. Air frames and delicate instruments are protected from shock.

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**Write today for additional information about LeTourneau Tow Vehicles for your work . . . or let us help you with other heavy handling problems where LeTourneau Electric Wheels could be applied. This equipment is manufactured by R. G. LeTourneau, Inc., Longview, Texas, manufacturers of BIG equipment since 1929.**

LETOURNEAU EQUIPMENT

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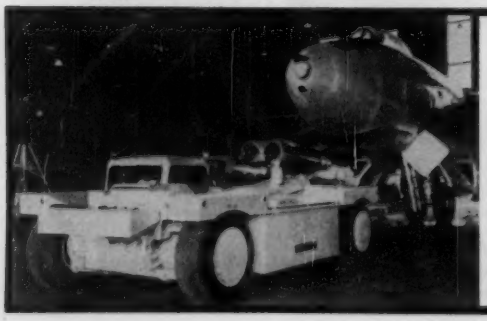
2607 South MacArthur Longview, Texas



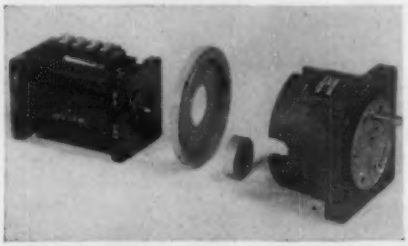
**MORE THAN JUST A TOW**

The same engine-generator system that supplies the Air Tow itself can also furnish ground power to aircraft. Electrically powered winches, hoists and air compressors are also available as optional equipment, making the LeTourneau Air Tow a full ground service unit.


on dial. Sensitivity is said to be 4 ohms/millivolt.—Assembly Products, Inc., Chesterland, Ohio.

**Special riveter** for handling delicate hollow or solid studs and pins has an automatic work cycle which includes hopper feeding of units on a combination anvil and pneumatic loader. Parts may have center distances as close as $\frac{3}{16}$ in., the maker reports. Manufacturer also offers dual-unit vertical floor model riveters with motor-driven rotation of peens for accomplishing cold flow of heads.—Lemert Engineering Co., Inc., 201 E. Jefferson St., Plymouth, Ind.

**Adapter kits** couple Link precision gear boxes to servo motors. Special adapter



kit allows coupling of the gear box to a flexible shaft.—Link Aviation, Inc., Binghamton, N. Y.

**Anemometer,** said to be accurate within 2% at velocities from 2 to 100 mph., reads in km./hr., mph., or knots at the flick of a switch. Unit is wind-powered. —W. & L. E. Gurley, Troy, N. Y.

**Model F Proto torque wrenches** meet USAF requirements of ±3% plus a maximum of 2 lb. the maker reports. Wrenches release automatically when they reach preset tension and reset for re-use.—Plomb Tool Co., Los Angeles, Calif.

**Acrawax C atomized** is finely powdered synthetic wax lubricant with 285F melting point.—Glyco Products Co., Inc., Empire State Bldg., New York 1.

**Electrical heat curing tape,** clear 1-mil polyester Mylar, is said to be resistant to paint and varnish solvent. P 253 tape will take 150C temperatures, the maker states.—Permacel Tape Corp., New Brunswick, N. J.

**Molykote 165X open gear lubricant** has an evaporating diluting agent which leaves a plastic film that withstands temperatures down to zero Fahrenheit, the maker states.—Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn.

**Model FG-60 6,000-lb. fork truck** is gasoline-powered, has 144-in maximum lift and turns in 85.5 in.—Baker-Raulang Co., Cleveland, Ohio.

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LETTERS

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# LETTERS

***Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.***

## 'Cone of Confusion'

The writer has read with much interest the informative article by Commander H. H. Ward III published in your issue of May 30th ("Phase Shift Cleans Up ADF 'Confusion'," p. 73).

His suggestions for cleaning up the so-called "cone of confusion" in ADFs are timely and helpful. He deserves credit for having carefully studied its cause and for having solved this deficiency. . .

There are other errors being made in the design of low frequency direction finders that should be corrected in the new miniaturized models soon to become available.

ADFs behave erratically in the presence of rain and snow static. This is the time when they are needed most and should be completely dependable. Recently approved ADF specifications seem to be silent as to requirements under such conditions.

I believe the trouble originates in the use of a single loop normally operating on the "null," discarding its signal. In its place an antenna, notorious for its ability to pick up precipitation static is used. This antenna is the source of the signal heard in the telephones.

Switching of the loop, in and out of phase with the antenna many times per second, interferes with the reception of weak signals and often causes the loop motor to start turning when a crash of lightning strikes the antenna while the loop is connected *in* phase and has subsided when it becomes connected *out* of phase.

The "Radioguide" direction finder was designed to avoid most of these shortcomings (see AVIATION WEEK, May 4, 1953, page 66). The twin crossed loops supplied a signal to the telephones 1.4 times as strong as one loop alone operated on the "maximum." Thorough electrostatic shielding excluded precipitation static interference with the bearing indication and from the headphones. No antenna is used, except momentarily, to resolve sense. Even then precipitation static does not interfere.

This was clearly demonstrated nine years ago at the Radio Laboratory at Wright Field when a high voltage precipitation static simulator was unable to disturb either the bearing or sense indication when the receiver was tuned to the Cleveland radio beacon—160 miles distant. No other direction finder at the laboratory at that time could meet this test.

Now to get back to the cone of silence indication that Commander Ward has aptly called the "cone of confusion." If two crossed loops only are used and no antenna, then only one indication occurs and that is the correct one. In the Radioguide, the needles of the cross-pointer indicator (similar to the standard glide-path meter) would fall off together, after a rapid build-up, telling the pilot that the airplane had passed directly over the transmitting antenna.

More often, however, one pointer would precede the other in falling off indicating a deviation to one side of center. The pointer dropping first told the side and the time interval told the extent of the deviation for any given altitude.

When no cone of silence existed, the instrument would nevertheless indicate passage over the station. Each loop would ultimately reach a position over the transmitting antenna tangential to a closed magnetic line of force. This would cause first one and then the other pointer to drop to zero.

Veteran pilots, like Clyde Pangborn and Harry Ashe, who flew with the Radioguide for many years, relied on this cone of silence indication for their let-downs in instrument weather. I doubt that they ever had cause to regret it.

Perhaps with Commander Ward's improvement it will now be safe for pilots to let down through the clouds with ordinary ADFs and depend upon correct phasing of loop and antenna voltages. Personally, I prefer the method above described.

EMIL J. SIMON
New York, N. Y.

## 'Wilson Doubletalk'

As a charter subscriber to AVIATION WEEK I have greatly enjoyed both the technical and editorial material you have published over the years. Of particular interest to me has been the series of recent articles concerned with research and development in the Air Force.

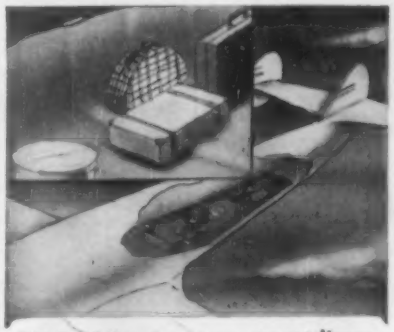
It is obvious that we need more top government officials of the caliber of Trevor Gardner or Robert B. Anderson. It has become obvious that these and other highly qualified individuals cannot operate with maximum effectiveness under Secretary of Defense Wilson. His bumblings reached a peak in the statement about basic research and oil which you quote on page 15 of the June 20 issue.

[Wilson said: *"The basic fundamental research thing would be—if you just drilled a hole anywhere over the world hoping you would find oil. The smart people in the oil business try to drill their holes for oil in a likely place, so the money that is given to the Department of Defense for research and development, I like to see spent in an area if you are successful in your research and what you hope to prove you finally are able to, it will be some use to us."*]

I can't understand what Wilson means here, can you? The statement is certainly a fine example of doubletalk born of ignorance.

Sympathetic toward Wilson when he was appointed, I now feel he is a liability to the Administration and a danger to the future progress and security of the country.

W. F. SMITH
Elnora, N. Y.

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He was always sure of his machined part price, right to the penny. He eliminated unforeseen losses being figured into his company's final costs. He saved extra freight costs of vendor-to-vendor shipments. He cut expediting time in half, and he protected his company's production schedule with Howard's one-source control.

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# USAF Contracts

Following is a list of recent contracts announced by the United States Air Force.

**Barrett Equipment Co.**, St. Louis 6, lathe, brake drum, floor mounted, 76 ea., $41,213.

**Chicago Pneumatic Tool Co.**, Atlanta, wrench-pneumatic, reversible, impact type, 693 ea., 319 ea., $109,186.

**Enterprise Co.**, Columbina, Ohio, saw, band, wood, 65 ea., $78,000.

**Glenn L. Martin Co.**, Baltimore, 3, kit, modification of nose gear door control mechanism, B-57A, RB-57A and B-57B, 259 ea., $71,095; kit "A," modification of horizontal stabilizer B-57A, B-57B and B-57C and RB-57A, 140 ea., $66,500.

**Hanchett Mfg. Co.**, Big Rapids, Mich., grinder, circular saw, 99 ea., $138,600.

**Ideal Electric & Mfg. Co.**, Mansfield, Ohio, motor-generator, skid mounted, output, 33 ea., $89,595.

**Ingersoll-Rand Co.**, Birmingham 3, Ala., wrench-pneumatic, reversible, impact type, straight handle, ⅝ in. square drive, ¼ in. bolt capacity, 120 ea.; offset handle, ⅝ in. square drive, ⅝ in. bolt capacity, 1,162 ea.; offset handle, ½ in. square drive, ⅝ in. bolt capacity, 784 ea.; offset handle, ¾ in. square drive, ¾ in. bolt capacity, 586 ea., $299,244.

**Radio Corp. of America**, Camden, N. J., baroresistors, 7 ea., 6 ea., controls, 60 ea., $108,867.

**Revere Corp. of America**, Wallingford, Conn., kits, electric, weighing aircraft, 150,000 lb. capacity, 286 ea., $631,714.

**Tumpane Co. of Georgia, Inc.**, Macon, Ga., repair and/or overhaul of Air Force Class 19a coolers, 33 ea., $26,000.

**Tye Taylor-Winfield Corp.**, Warren, Ohio, welding machines, electric resist., spot-press type-air operated, 30 ea., $210,000.

**Reliance Chemical Co.**, Lee Terminal, Louisville 12, Ky., compound, 111,300 gal, $132,765.

**Trio Chemical Works, Inc.**, 341 Scholes St., Brooklyn 6, N. Y., compound, 76,300 gal., $72,300.

**ACF Industries, Inc., Engineering and Research Div.**, Hyattsville, Md., flight simulator spares and support data, $1,477,935.

**Curtiss-Wright Corp., Metal Processing Div.**, Buffalo, N. Y., design, manufacture and acquisition of machinery and equipment, $700,000.

**Douglas Aircraft Co., Inc.**, Long Beach, Calif., facilities for the production flight testing of B-66 acft., $401,000.

**Electric Service Mfg. Co.**, Philadelphia 32, signal assys., 4,455 ea., $28,200.

**General Electric Co., X-Ray Dept.**, Milwaukee, camera, 12 ea., 9 ea., $59,466.

**General Motors Corp., Allison Div.**, Dayton, spare propeller parts for Navy acft., $280,664.

**General Motors Corp., Allison Div.**, Indianapolis 6, turbojet acft. engines, 46 ea., $930,580.

**Glenn L. Martin Co.**, Baltimore 3, increase in sets of spec. equip., initial support spare parts, revisions to data, $1,318,599.

**International Telephone and Telegraph Corp., Federal Telecommunications Div.**, Nutley, N. J., facilities, $35,515.

**Radio Corp. of America, Engineering Product Div.**, Camden, N. J., public address group, spare parts and data, $26,627.

**Simmon Bros., Inc.**, Long Island City 1, N. Y., enlargers, 21 ea., revisions to handbooks, $38,850.

**Willys Motors, Inc., Engine Div.**, 12801 E. Jefferson, Detroit 15, R1300 engine spare parts, 530,548 ea., $220,959.

**Admiral Corp.**, 3800 Cortland St., Chicago 47, Ill., repair and overhaul of AN/ARC-27 components, C/628/ARC-27, 35 ea., GFP RT-178/ARC-27, 600 ea., GFP MT-822/ARC-27, 30 ea., GFP MT-822A/ARC-27, 60 ea., $94,720.

**Bendix Radio Div., Bendix Aviation Corp.**, Towson 4, Md., relay, solenoid, nonpileup type, SPST, 305 ea., $86,580.

**Cosmos Industries, Inc.**, 21-28 Queens Blvd., Long Island City, N. Y., signal generator SG-1, 137 ea., $141,300.

**Radio Corp of America, Tube Div.**, 415 S. 5th St., Harrison, N. J., tube, electron, type 6161, transmitting UHF, power triode, 600 ea., $51,000.

# ENGINEERS

**LONG-RANGE CONTINUING OPPORTUNITY FOR ELECTRICAL AND MECHANICAL**

# ENGINEERS

**AT**

**Bendix**

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**Mechanical or electrical engineer to supervise the research and development of liquid propellant rocket controls, systems design, component design, development and testing.**

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**Requiring an engineering degree in electrical engineering or math and physics, plus at least three years of experience in design analysis of feedback control systems. Should be familiar with frequency response methods as applied to feedback control synthesis. Analog computer and simulator experience highly desirable. Activity is in the field of aircraft and missile power plant controls including gas turbine, ram jet, and rocket types. Controls are largely hydro-mechanical. The fuel metering research facility includes an analog computer and jet engine simulators.**

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**Send detailed resume listing education, engineering experience, and salary requirement to:**

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**We guarante you an immediate reply -**

# EMPLOYMENT OPPORTUNITIES

NATIONAL COVERAGE

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

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# ENGINEERS

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**AERODYNAMICIST** An aerodynamics engineer (3-4 years experience) experience in analysis of aerodynamic data and stability problems. To investigate stability and control problems under supervision. Extremely interesting work in advanced problems.

**AERODYNAMICIST** Man with ability to combine theoretical and practical aerodynamics to determine aerodynamic load distributions and to work in the field of aeroelastic analysis. A background knowledge of compressible and incompressible flow of perfect fluids and an understanding of basic engineering mathematics is desirable. This position offers an exceptional opportunity for professional development in fundamental aerodynamic analysis.

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**AERODYNAMICIST** For Flight Test Engineer position. Aero education and experience with stability required. To work on planning and analysis of high speed experimental flight programs.

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**ELECTRONICS ENGINEER** Familiar with airborne electronic equipment (communications, navigation I.F.F., Radar and Autopilots), preferably with 2 to 4 years aircraft experience. Should be a college graduate. Duties will include system investigations, establishing test procedures and conducting environmental tests on airborne electronic equipment and components.

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Specialized openings for Thermodynamics engineers in the following categories. B.S. in M.E. or A.E. required.

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*Please address complete resume, outlining details of your technical background, to:*

**Assistant Chief Engineer**
*Administration*
**Mr. R. L. Bortner**

**REPUBLIC AVIATION**

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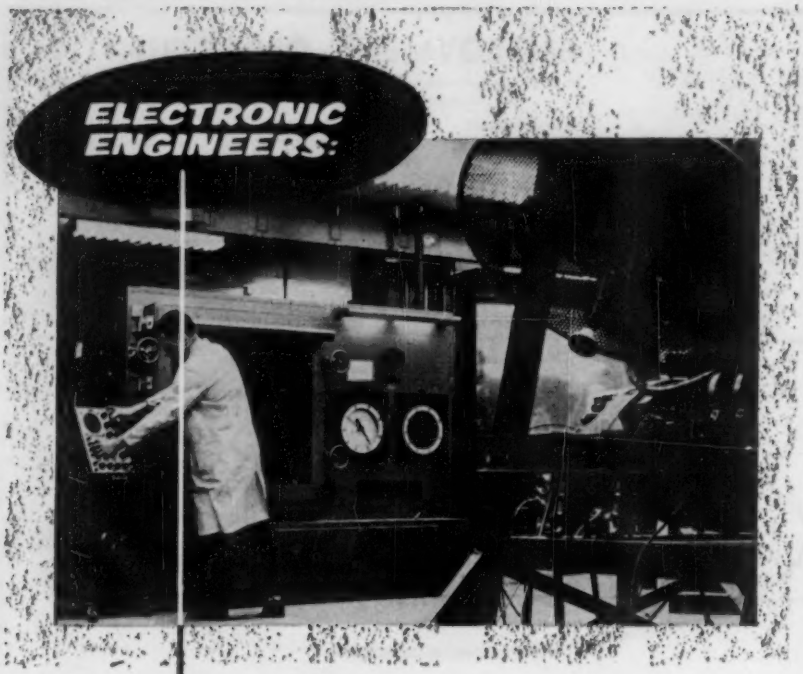


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*Your letter of inquiry will receive prompt attention and reply. Please write to—*

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*N. T. Avant, aerodynamicist (left), R. R. Heppe, Aerodynamic Department head (center), and C. F. Branson, aerodynamicist, discuss wind tunnel tests to determine transition height of a supersonic superiority fighter.*

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Aerodynamics Engineers at Lockheed are working on advanced problems that cover virtually every phase of aircraft. The full scope of their work can be seen in the wide range of aerodynamics problems encountered in Lockheed's diversified development program.

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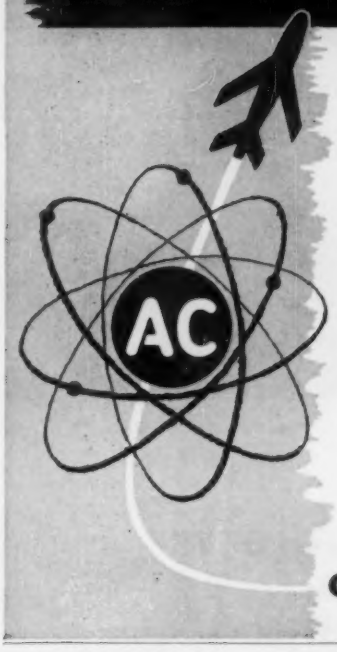


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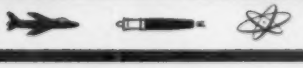

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*Lockheed*

**MISSILE SYSTEMS DIVISION**

*research and engineering staff*

LOCKHEED AIRCRAFT CORPORATION

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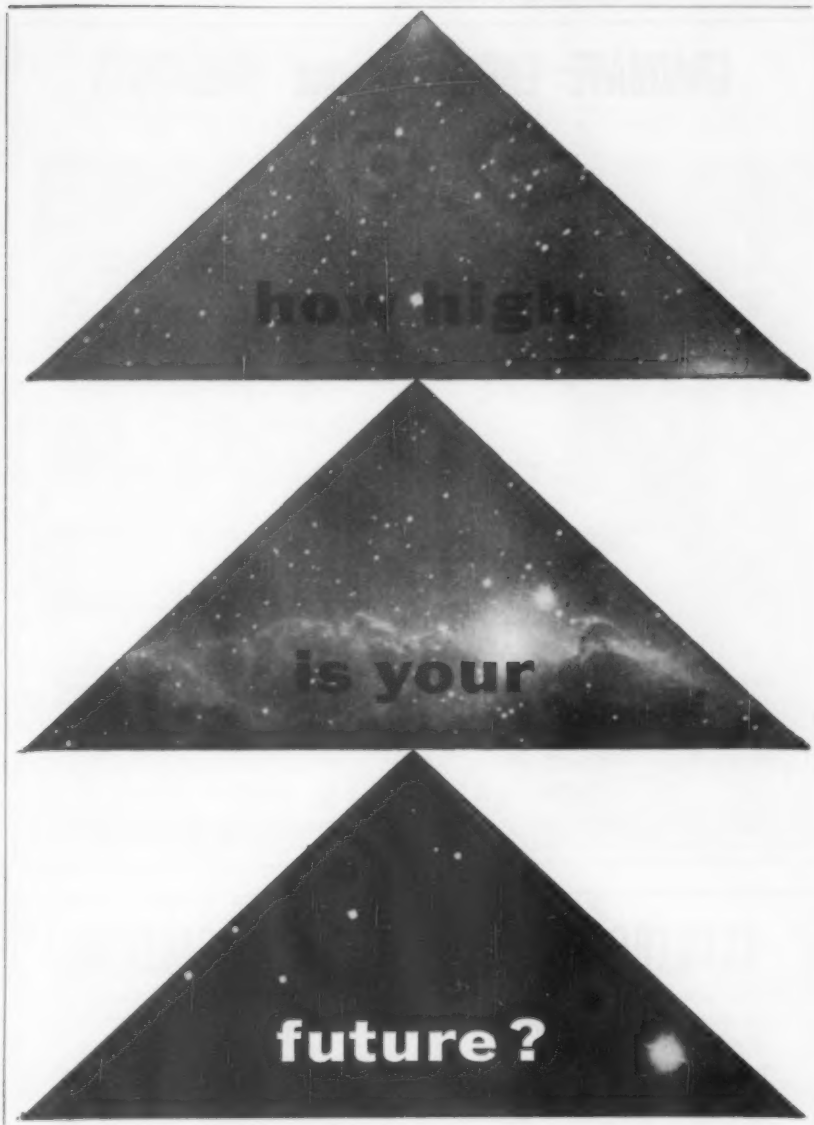


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4 Meteorologists
5 Physical & Electrical Chemists

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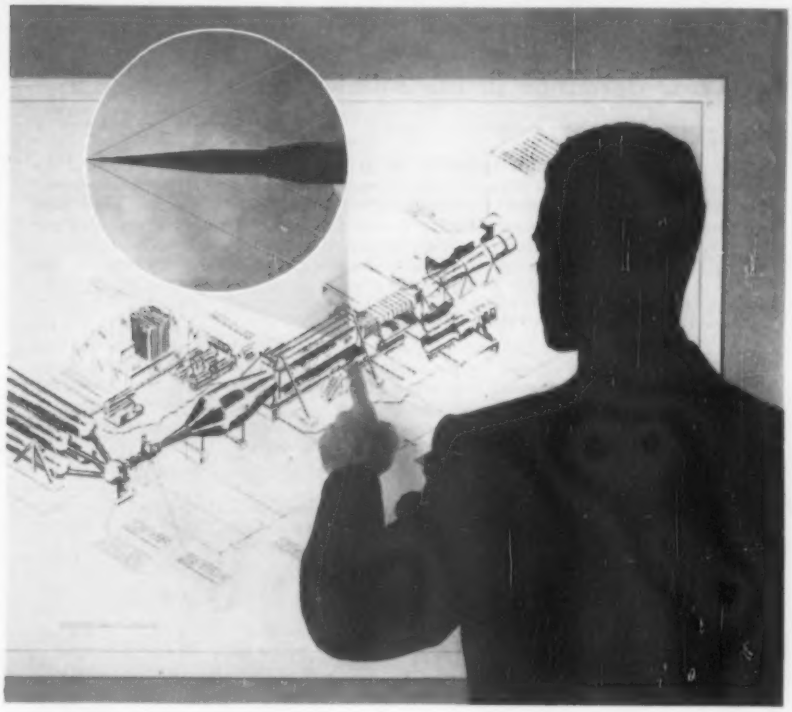

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Work on the development of the service and maintenance aspects of the most advanced type aircraft. Also, work on maintainability improvement on the first production turbo-prop cargo airplane. Applicants must have 4 years engineering degree or equivalent and have ability to analyze, evaluate and resolve a wide variety of aircraft service and maintenance problems. Considerable experience with airline type overhaul and maintenance. An excellent opportunity in a new organization.

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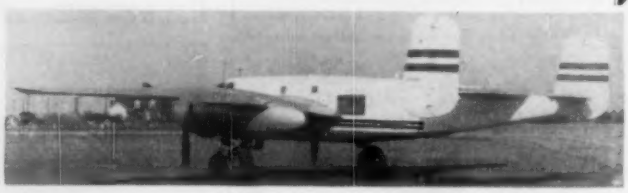

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AVIATION WEEK

THE MAGAZINE OF AVIATION BUSINESS

ROBERT W. MARTIN, JR. PUBLISHER

A McGRAW-HILL PUBLICATION
330 WEST 42ND ST., NEW YORK 36, N.Y.

July 11, 1955

MEMORANDUM TO THE AVIATION INDUSTRY

The tremendous growth of aviation has created a whole new field of needed information services. Today, because of the great expansion of our industry, a publishing task of major importance is the establishment of our industry's first comprehensive annual buyers' guide with a circulation large enough to penetrate the industry's major purchasing influences, domestically and internationally.

November, 1955 will mark the publication of the AVIATION WEEK Buyers' Guide--an annual edition that will answer the long-felt demand of our industry's buyers, in civilian, Air Force and governmental capacities.

Questionnaires are now being mailed to every manufacturer of record engaged in the production and supply of aeronautical products and materials. A year-round research group under editorial supervision has been established to seek out new products, new terminologies--to check and double check the accuracy of all information to be published--the availability and actual production of all items featured.

AVIATION WEEK's annual Buyers' Guide will establish a publishing service unique to our industry. It will be complete and comprehensive--with complete listing of all manufacturers of aeronautical and allied products--not just a token listing; correct and complete addresses; sufficient cross indexing to locate any product regardless of terminology . . . and most important, the Buyers' Guide format will provide, in one complete listing, a simple, easily used method of locating any product. In addition to these important details, the Buyers' Guide will have trade name and distributor listings. These are the factors of completeness--these are the essential features that will make AVIATION WEEK's Buyers' Guide a must for every aviation purchasing influence. Special mailing pieces, individual rate cards and other detailed information will shortly be forwarded covering this new AVIATION WEEK service.

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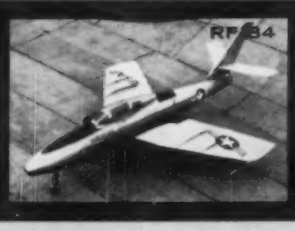

*CF-100's in formation on winter patrol over Canada's Northern approaches.*

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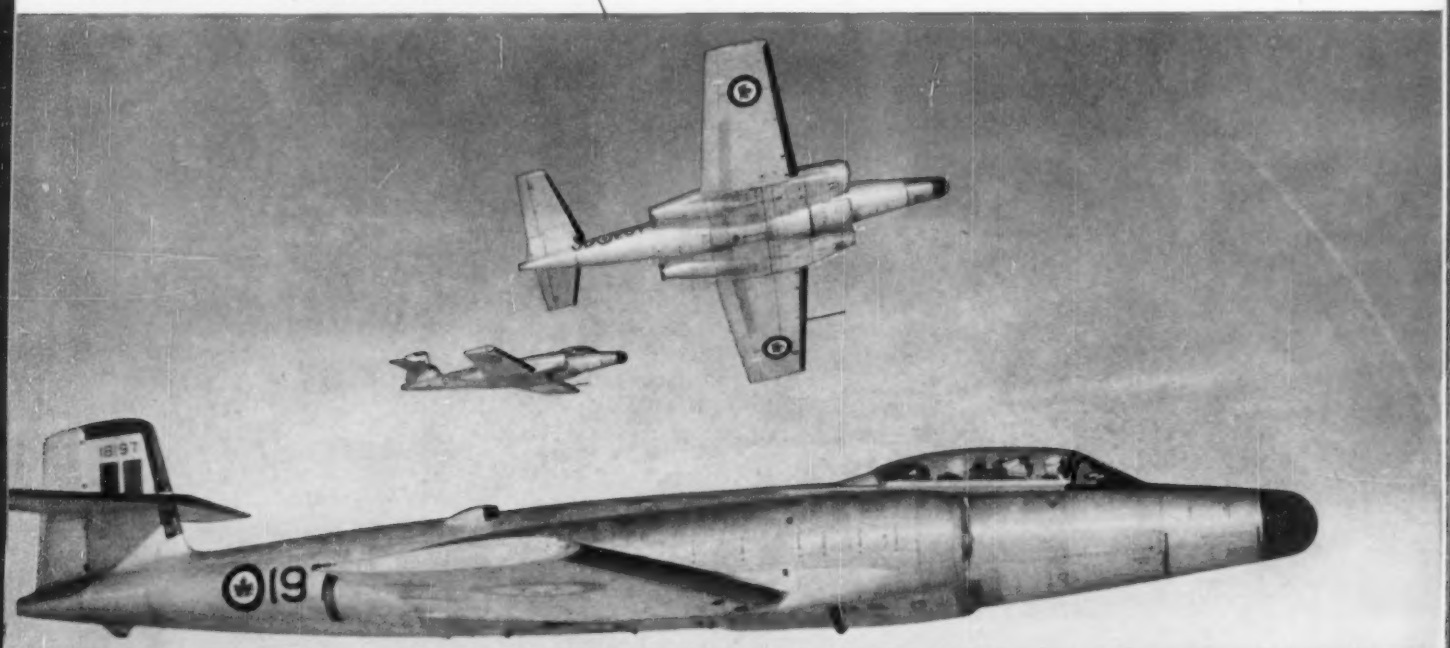

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# CAB Orders North American Grounded

## Board revokes Letters of Registration for four irregular carriers, charges violations, 'mockery.'

By Craig Lewis

**Washington, D. C.**—The last of the big nonscheduled aircoach operators lost a vital round in its fight to stay in business when the Civil Aeronautics Board acted to revoke the operating authority of the North American Airlines carriers.

In a complicated legal decision, CAB found that the individuals and companies involved in the Twentieth Century compliance proceeding are operating illegally. The Board ordered them to stop illegal operations immediately.

The CAB also revoked the Letters of Registration of the four irregular carriers flying under the North American name—Twentieth Century Air Lines, Trans National Airlines, Trans American Airways and Hemisphere Air Transport.

The decision isn't expected to effect North American's operation for the time being, since there are some legal steps the nonsked can take, such as requests for reconsideration from the CAB and review by the Court of Appeals, before it becomes really final.

### Four Reasons Cited

In its findings, the Board described four separate bases for revocation. Taken together, the Board finds these violations make revocation inevitable:

- **Participation in a combine** engaged in unauthorized direct, frequent and regular air transportation;
- **Consolidation or merging** of properties into one "person" in violation of the Civil Aeronautics Act;
- **Individual and collective** advertising and operation of regular and frequent air transportation;
- **Ticketing practices** which violated the CAB economic regulations.

The CAB also found that the four principal individuals involved in the case—Stanley D. Weiss, James Fischgrund, Jack B. Lewin and R. R. Hart—had illegally acquired control of the four irregulars, merged the properties without Board approval and, together without associated companies, operated a single, integrated air carrier without a certificate of public convenience and necessity.

In its opinion, the Board accuses North American of trying to avoid the consequences of illegal activities by claiming serious legal doubts as to whether their conduct was unlawful. The CAB says: "When we cut through the web of inter-company dealings and technical devices employed by the respondents, it is perfectly clear that the respondents have attempted to make a mockery of the Board's regulations and to operate without regard for the requirements of the Civil Aeronautics Act.

"No amount of pious protestations by respondents can now obscure the fact that they deliberately embark upon an involved scheme to operate a regular scheduled transcontinental air transportation business without a certificate of public convenience and necessity or other appropriate operating authority."

### Activity Is "Unlawful"

CAB says that North American attempted to give a semblance of propriety to their operations through the use of four different Letters of Registration held by four ostensibly independent irregular carriers.

But the Board says that "the independence of these companies was nominal rather than real; and the alleged owners of these carriers were merely straw men set up to conceal the identity of the true owners.

"In a very real sense, the individual respondents herein were puppeteers, manipulating their controls over their different enterprises to maintain the appearance of separate operations by each carrier respondent, while in fact engaging in regular scheduled air transportation as a single company."

"And now," says the Board, "with the same degree of legal legerdemain employed in construction the North American combine, respondents have resorted to a multiplicity of technical legal arguments in an attempt to escape the consequences of their unlawful activities."

In answer to North American claims that regulations the carrier is supposed to have violated are invalid because they were promulgated without adjudicatory hearings, the CAB calls the attack on the regulations' a smokescreen designed to minimize the "contumacious conduct" of the respondents.

The Board concludes that Weiss, Hart, Fischgrund and Lewin are engaged in direct air transportation. "These respondents are actually furnishing the transportation through their own instrumentalities and not merely undertaking responsibility to see that the transportation will be provided by others, as in the case of a freight forwarder or express company."

North American contended that a CAB examiner gave consideration to the compliance proceeding out of turn ahead of the New York-Chicago case, in which the nonsked is an applicant. CAB says that the merits of North American's certificate application have no relevance to the compliance case, and that the carrier has no legal right to prior or contemporaneous decision on its certificate application.

### Others May Follow

"Apparently," says the Board, "Respondents assume that by filing applications for certificates in route proceedings, they can, regardless of the outcome of such proceedings, buy addi-

## Home-Owners Quieted

Port of Seattle, operator of Seattle-Tacoma International Airport, has made some headway in a struggle against nearby homeowners who have been seeking a court order to prevent planes from flying less than 500 ft. over their property.

Half of the 30 residents withdrew their motion for a court order after the airport said it would purchase their property for use as a flight corridor. Rights of the 15 whose property is not within this proposed flight corridor will be determined in a court at a future date.

A recent New York Federal District Court decision that air space is part of the public domain negated a local ordinance by which the residents of Cedarhurst, L. I., had sought to restrict traffic into N. Y. International Airport (AW July 4, p. 85). The decision was seen by industry observers as checking threats by airport neighbors such as those in Seattle.

The Port of Seattle is still faced with a pending suit filed by 24 property owners north of the field, who ask $1,256,726 damages on the grounds that peaceful enjoyment of their homes is disturbed by the noise of planes operating from the field.

tional time for continuing their unlawful activities."

The CAB stresses the importance of backing up the Civil Aeronautics Act and its own rules and regulations. If North American is allowed to violate rules with impunity, says the Board, other carriers may follow suit, weakening the whole regulatory structure. While safety regulations aren't an issue in the compliance case, the Board states that "it must be apparent that disregard of the Board's economic regulations cannot be condoned without running the risk that general respect for the Board's safety regulations also will be placed in jeopardy."

In a separate action, the CAB turned down a North American motion, filed on the day the decision was issued, to disqualify member Harmar D. Denny from participation in the compliance case and refused to withhold disclosure of the motion to the public.

In reply to North American's contention that Denny is biased and prejudiced and not judically competent, capable or qualified to participate in the proceeding, the Board observed that the motion could have been filed earlier since the alleged facts upon which it was based occurred approximately a year ago. The Board also expressed satisfaction that the motion isn't sufficient grounds for disqualifying Denny or cause for further inquiry.

### Adams Dissents

CAB Vice Chairman Joseph P. Adams filed a separate opinion, taking issue with the revocation action of the majority. Adams agrees that North American violated regulations, but he feels that revocation of the carriers' letters of registration is too extreme.

"I should like to make it clear at the outset," says Adams, "that my basic difference with the majority here is one of long standing, which transcends this particular enforcement action. It involves a difference in understanding as to the relative importance to be attached to this Board's promotional and developmental responsibilities as compared with our regulatory duties."

Adams feels that the Board majority has leaned too heavily toward its regulatory function in the case and treated the interests of the traveling public too lightly. He says that public benefits resulting from North American operations, including stimulation of general low fare aircoach operation, should be carefully weighed in the Board's consideration of the case.

In his dissent, Adams points to the Board's treatment of the air cargo problem as an example of enlightened regulation and development. He says that this precedent relative to the shipping public should be applied to the traveling public in the North American case.

# National Airlines Buying Electras, DC-8s in $95 Million Expansion

National Airlines will buy Lockheed Electra turboprop airliners and Douglas DC-8 jet transports. Total order is expected to be for 12 Electras and six DC-8's.

Plans to buy both turboprop and turbojet aircraft by National as part of a $95 million, four-year expansion program was announced last week by President George T. Baker.

In addition to jet purchases, Baker also reported National will order several more Douglas DC-7 piston-engined transports. Baker did not specify what gas turbine powered transport National would buy but industry sources said he would follow American Airlines lead in picking the Electra as the standard medium haul replacement for the current Convair-Liner fleets. National is expected to buy the turbojet powered DC-8 for its New York-Miami non-stop service.

### New Buildings

Along with its planned fleet development, National's expansion program includes construction of new office building and maintenance facilities. The first phase of this project is to begin with the building of new general administrative offices for National at Miami International Airport. The construction of new hangar facilities for the maintenance of the jet transports is to follow. Baker said the cost of the overall building and equipment program is to be covered for the most part by corporate earnings.

Bank loans will not exceed $25 million, he said.

National's entry in the jet equipment market has a stimulating effect on the airline race now underway for U.S. built jet transports. National is the first trunk airline to order the Douglas DC-8 jet transport, and is the second air carrier in line for Lockheed's Electra turboprop.

First purchase of the Lockheed Electra was American Airline's order for 35 as an initial replacement for its fleet of 75 Convair 240's (AW June 13, p. 12). In a similar program National will buy 12 Electras to replace the 12 Convair 340's it is now operating. The first order may only be for six but later would be doubled for a fleet of 12 turboprop aircraft. American is also expected to order the DC-8.

### Equipment Edge

Big benefit to National in immediately following American's lead on the Electra is the competitive advantage of taking an early position on the Lockheed production line and getting the jump on delivery schedules. Eastern Air Lines is seriously considering the Lockheed Electra with a decision expected soon.

If National gets Electras or DC-8s before Eastern, it will continue its current equipment advantage in the bitter battle for the heavy passenger traffic in the New York-Maimi market.

The jet buying problem is identical to the situation that prevails today between the two North-South rivals with the Douglas DC-7. National bought DC-7's first and has been operating them for over a year while Eastern is still awaiting its initial DC-7 delivery after a quick switch from Super Constellations.

National's planned purchase of Douglas DC-8 jet transports should put the East Coast carrier near the top of the line for 1959 deliveries. It also is bound to have the effect of setting off a series of competitive orders for the DC-8 as it has for the Electra.

# UAL May Buy Boeing Jet Liners

**Seattle**—United Air Lines may buy 20 Boeing jet airliners, if the manufacturer can obtain USAF approval for the sale, UAL president William A. Patterson indicated last week.

Boeing sources said there is no firm agreement with Patterson on purchase of a commercial version of the 707 prototype. Patterson's remarks were an about-face on earlier unfavorable comparisons he has made between the Boeing 707 and Douglas DC-8.

A Boeing source said other airlines also have expressed renewed interest in the 707. It was apparent the manufacturer hopes to announce a firm order before the month is out. A rumor that American Airlines has reached a "verbal" agreement with Douglas Aircraft Co. on purchase of 25 DC-8s is said to have sparked interest of other airlines in the Boeing jet.

Patterson noted that Boeing should be able to offer "a strong price advantage" over competing manufacturers because of its jet production experience. Patterson also pointed out that Boeing's jet transport already is flying. He said "there is no question but that Boeing has the added know-how because of its actual experience."

J. A. Herlihy, vice president-engineer-

ing for UAL, made a flight in the 707 and other members of the UAL staff toured the Boeing facilities. Patterson was quoted as saying United wants to place its jet order by Dec. 31 for jets to be in operation by 1960.

This confirms an exclusive story in AVIATION WEEK (Jan. 10, p. 13) that Patterson intends to order jet transports this year.

United's board of directors met last week in Seattle lending strength to the reports of UAL interest in the Boeing 707.

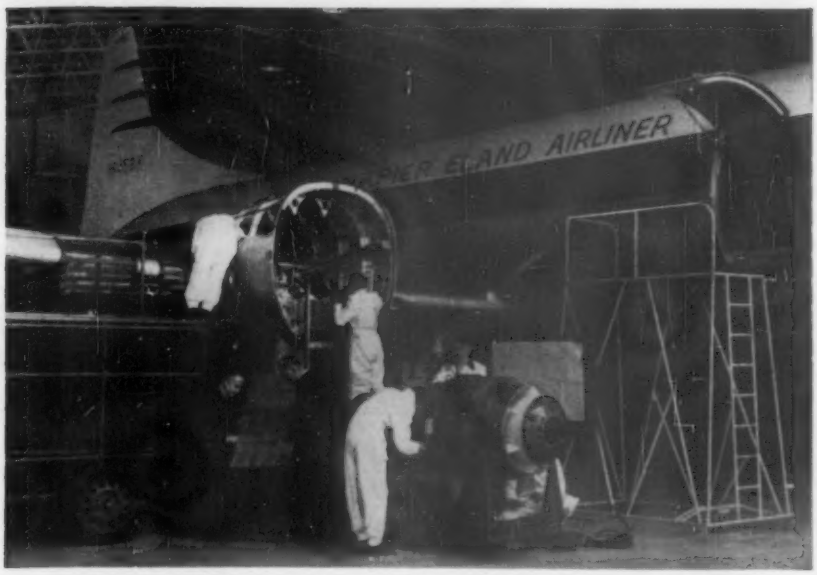
Patterson said United's only concern is in which jet it will buy.

"We want to be flying jet airliners by 1960," he said. "Boeing is flying, others are now in the planning stage. There isn't very much difference in engineering and production in any of them."

## TWA Proposes New Far East Service

Trans World Airlines tried a new approach last week to obtain route extensions in the Far East in order to join with Northwest Airlines and establish a second U.S. global service. Turned down once on a request for Tokyo as a junction point with Northwest, TWA has now applied to Civil Aeronautics Board with an alternate proposal for a Manila service. Specifically, TWA wants a route extension from Bombay and Colombo, Ceylon, to Manila via Bangkok.

TWA says the route proposal does not duplicate any American air carrier services, but would provide more lines of communication through southeast Asia.




## Napier Flight-Tests Eland for Convair 340

Tests of Napier Eland turboprop engine have been proceeding in a Vickers Varsity flying test bed (top) since last summer (AW June 20, p. 21). The company says the engine has never failed to relight after being killed in numerous tests in the Varsity. Bottom photo shows Napier technicians preparing Convair 340 nacelle to take the 3,200-eshp. powerplant. The Eland-Convair is slated to start preflight tests this fall, then make a demonstration tour of the U. S., Canada and Europe. Napier says the turboprop engine will boost the 340's cruising speed 50 mph. at 1,500-mi. range with maximum payload.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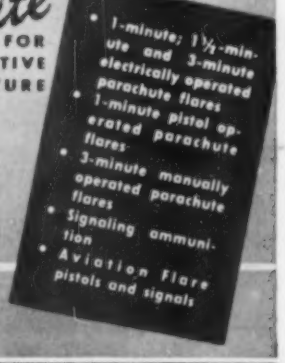
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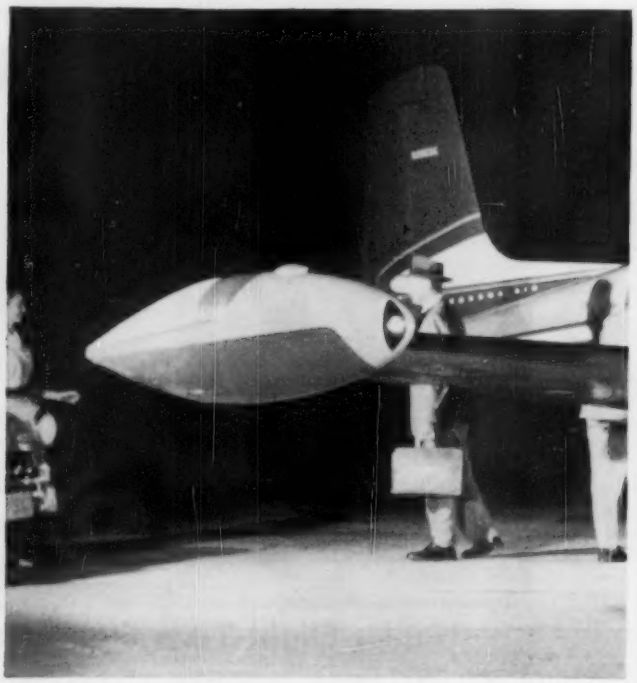

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To meet demands of the jet age, the Air Force awarded Cessna the responsibility of developing a jet trainer which will make the move into turbojet-powered airplanes easier.

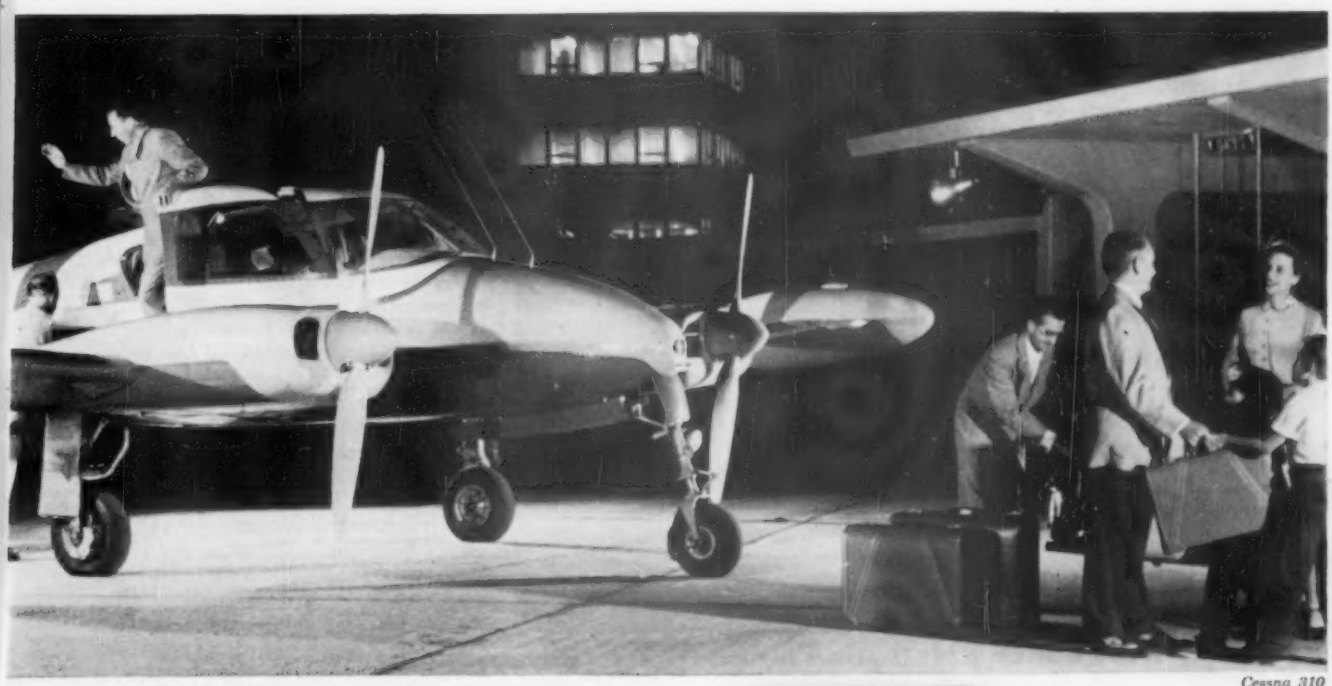
The Cessna-developed T-37 is designed for this specific job. It will fly at both high and low speeds, has outstanding altitude performance, permits smoother, safer transition to jet flying at an earlier phase in a cadet-pilot's training program. This, in turn, means substantial savings in time and training costs for the Air Force.

Given the responsibility of developing this new trainer, Cessna is proud and privileged to join with the Air Force in planning for the jet age.

# *ready when you are!*

For more information about the 1955 Cessnas, see your nearest Cessna dealer (listed in yellow pages of phone book) or write CESSNA AIRCRAFT CO., DEPT.AW-7, Wichita, Kansas.

## A Cessna for every size and type of business



*Cessna 310*

## All-New Cessna 310

Fastest of the new twins. Wing-tip tanks hold gas load. Retractable landing gear. Can climb—fully loaded—380 ft. a minute on one engine, travel 1,640 miles in a day.* Priced surprisingly low—$49,950 f.o.b. Wichita.

*8-hour day

Cessna

# CAA Told to Speed Radar Traffic Control

**Washington D. C.**—Strong pressure to spur Civil Aeronautics Administration into discharging its legal responsibility to develop a radar air traffic control system adequate to handle the rapidly increasing military and civil aircraft load was generated by the Air Coordinating Committee last week.

ACC approved recommendations of its Nav-Panel Special Working Group (SWG–13) and ordered CAA to conduct a detailed study on integration of military air defense radar installations in a common system of air traffic control.

ACC has set an August 1 deadline for completion of the CAA study in an effort to stir action on a situation that has been allowed to drift for several years.

Industry sources note increasing pressure on CAA to assume its legal responsibility for developing and operating a more efficient traffic control system to meet the demands of current and future air traffic loads from the military services, airlines and the top level of the Commerce Department.

These sources predict that if CAA does not meet its August 1 deadline with a positive, workable plan there will be strong pressure from the military services to take over CAA's air traffic control function and operation of the federal airways system.

### Nav Panel Study

The program adopted by ACC came as the immediate result of an urgent recommendation from its Nav-Panel Special Working Group.

As an operational policy group directed to examine all phases of the common system program, SWG–13 submitted an interim report calling for immediate action to counter "a growth of unfavorable balance between the steadily increasing demand on the system and operational capability." The report specifically referred to an urgent need to accelerate the program for integration of air defense and air traffic control functions.

It was further suggested that pending an October 1 completion date for the final SWG–13 report, ACC would want to set September 1 as a deadline for CAA's evaluation of defense and air traffic control integration. The SWG–13 recommendations were accepted completely by ACC except for advancing CAA's deadline to October 1.

### Plan of Action

Most important aspect of the ACC decision was placing the problem squarely up to CAA, which has the statutory responsibility for operation of the air traffic control system. In a tersely worded announcement, ACC outlined a plan of action that:

- **Requires** CAA to develop a proposal for the earliest possible large-scale service evaluation of a first stage integration of air defense and air traffic control.
- **Establishes** August 1, 1955 as the deadline for submission of such a plan which should be as detailed and specific as possible within the time limit.

Details of the plan as recommended by SWG–13 included the following:

- **Delegate** CAA to handle the evaluation.
- **Use the Boston area** as the most logical area to conduct the evaluation.
- **Make the services** of ACC's Nav-Panel available to assist CAA in developing an evaluation proposal.
- **Have** CAA obtain the full coordination and cooperation of the Department of Defense, Air Navigation and Development Board, and the Lincoln Laboratories.

It was pointedly made clear in the SWG–13 report that there is no intention of a review of the air defense program. Rather, the report pointed only to an effort to bring the common civil/military air traffic control system into closer relationship with the air defense system in order to improve the capabilities of each system.

Existence of certain independent activities aimed at radar control integration was acknowledged, but the report decried the absence of an adequate link with the defense planning in progress at the Lincoln Laboratories. It bluntly stated:

"The full capability of CAA, ANDB, ACC, Department of Defense and the Lincoln Laboratories had not been brought to bear on the problem in a coordinated program."

Other recommendations that will be included in a final SWG–13 report will repeat those made by a predeccesor group (SWG–5), which completed its report on "air traffic control and the national security" in December 1950. They are based on the fact, as true in 1955 as in 1950, that "the air traffic control system has not kept pace with the increased demands on the system."

### Priority Problems

Problems requiring priority attention included the need for:

- **Expanded use** of radar in the common system.
- **Combined** ATC/ADC use of air defense radar.
- **Wider use** of direct pilot to controller communications.
- **Segregation** of high altitude jet traffic in separate high altitude sectors.
- **Expedited transition** to a single "common" system of navigation.
- **Further development** of basic radar and the secondary radar beacon systems.
- **Development** of a large size horizontal plotting display for use with long range radars.
- **Development** of data transfer and display equipment.

Over the years there have been those who maintained that the most promising method and only medium through which the highest degree of efficiency can be attained in air traffic control is a single radar system. CAA spokesmen acknowledge that it is not a new idea but admit they have now been spurred into doing in five weeks that which "we'd probably have taken much longer on. The ACC decision brings us closer

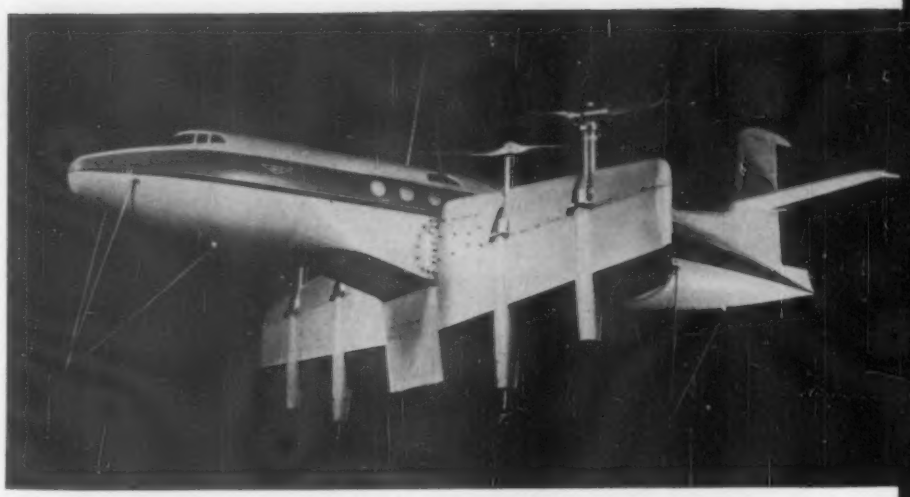
## Milwaukee's New Air Terminal

**Milwaukee will open its new $3.2-million air terminal building at General Mitchell Field, about 6½ mi. from downtown, July 22. The building will provide quarters for the seven carriers that serve Milwaukee—American, Capital, Flying Tiger, North Central, Northwest, Ozark and United. The city claims its air passenger volume has increased fourteen-fold in the last 10 years, compared with an eight-fold increase for the nation. Milwaukee's investment in General Mitchell Field is now $16 million.**

to action much sooner than we had expected to be."

The outstanding problem among many problems is how to integrate all the radar systems, civil and military, including the Air Defense Command, into an overall system. A suggested plan for integrating the several radar systems is the remoting of raw radar data between CAA air traffic control centers and the ADC system. This has poised the question as to whether the remoting of raw data can be accomplished, and, if so, whether the cost is worthwhile. The answer to such problems, of course, will only be the beginning.

There is no question that it will require several years and a number of stages to develop an acceptable ATC system that embraces the use of air defense radar. However, ACC has now assured that there will be consistent progress toward such an objective.



**Development Model for VTOL Transport**

**Experimental VTOL transport model of the National Advisory Committee for Aeronautics' Langley Laboratory uses upward-pointed wings and propellers to provide lift for takeoff, hovering and landing. Wings and props return to conventional position for forward flight. This approach is a development comparable to the experimental Langley VTOL model in which retractable turning vanes or slats created vertical lift, while wings and props remained in normal position (AW June 13, p. 30). The one-tenth-scale model is capable of free flight, remotely controlled through the overhead cable, which also supplies power for the aircraft's electric motors.**

## Sikorsky Offers S-58 For 1956 Delivery

Commercial helicopter operators can place orders for the 12-passenger Sikorsky S-58, with deliveries scheduled to start in mid-1956. The single-rotor copter, a civil version of the Navy's anti-sub HSS-1, is in process of Civil Aeronautics Administration, and certification is expected to be approved early next year.

The S-58's entry in the airline and industrial field competes with Piasecki's recent offering of a civil version of its tandem-rotor H-21, designated PH-42 (AW July 4, p. 80). Both craft have been undergoing study by New York Airways as interim types pending development of a three-turbine, 30-passenger configuration (AW May 23, p. 20).

Sikorsky spokesmen credit the S-58 with a payload of 4,000 lb. on distances over 100 nautical miles and a cruising speed of over 100 mph. The military XHSS-1 has attained 144 mph. in level flight during tests (AW May 10, 1954, p. 11). The S-58 will be powered by a 1,425-hp. civilian version of the Wright R1820-84.

Sikorsky expects that about half of civil S-58 sales will be to airlines the other half to industrial and utility operators.

Customers will be able to specify either one or more cabin doors.

## Cabinet Rejects PAL Stock Purchase Offers

**Manila**—Pan American World Airways' offer to purchase a 20% interest in Philippine Air Lines from the government has been rejected by President Magsaysay's cabinet. The government turned down the transaction saying that it feared that it would lose its control of the airline. The decision prevailed despite a memorandum from the National Development Co. that PAA and Col. Andres Soriano, PAL president, had agreed to sign voting pledges giving NDC control. Soriano, the largest individual holder, owns 26.25% of the shares.

The Philippine cabinet also rejected an NDC recommendation that PAL's pilot's association be allowed to purchase 43,350 shares.

## Carriers May Lease Navy Cargo Aircraft

The Navy last week offered to lease four cargo transport aircraft to qualified commercial operators as the first step toward implementing an Air Coordinating Committee-approved cargo-aircraft leasing program (AW June 13, p. 135).

The rental of Navy planes—two DC-6A's and two DC-4's are being made available—is subject to a number of restrictions set down by ACC. Commercial operators leasing them must be in the air-freight business, use the planes for cargo operations, and provide for maintenance according to CAA and Navy standards. Lessees of the DC-6A's will further be required to place orders for new replacement planes within one year.

Navy will allocate the aircraft to eligible applicants with the advice of the Civil Aeronautics Board. CAB also was consulted by Navy in setting the monthly rental rates. A one-year lease of a DC-6A will cost $252,000 or $21,000 a month. The final rate on the DC-4 has not been determined but it is expected to be set at the prevailing market price between $12,000 and $15,000 a month. Some 32 airlines, scheduled and non-scheduled, have been queried by Navy as to interest in participating in the cargo-aircraft leasing program.

## CAB ORDERS

(June 23 to June 29)

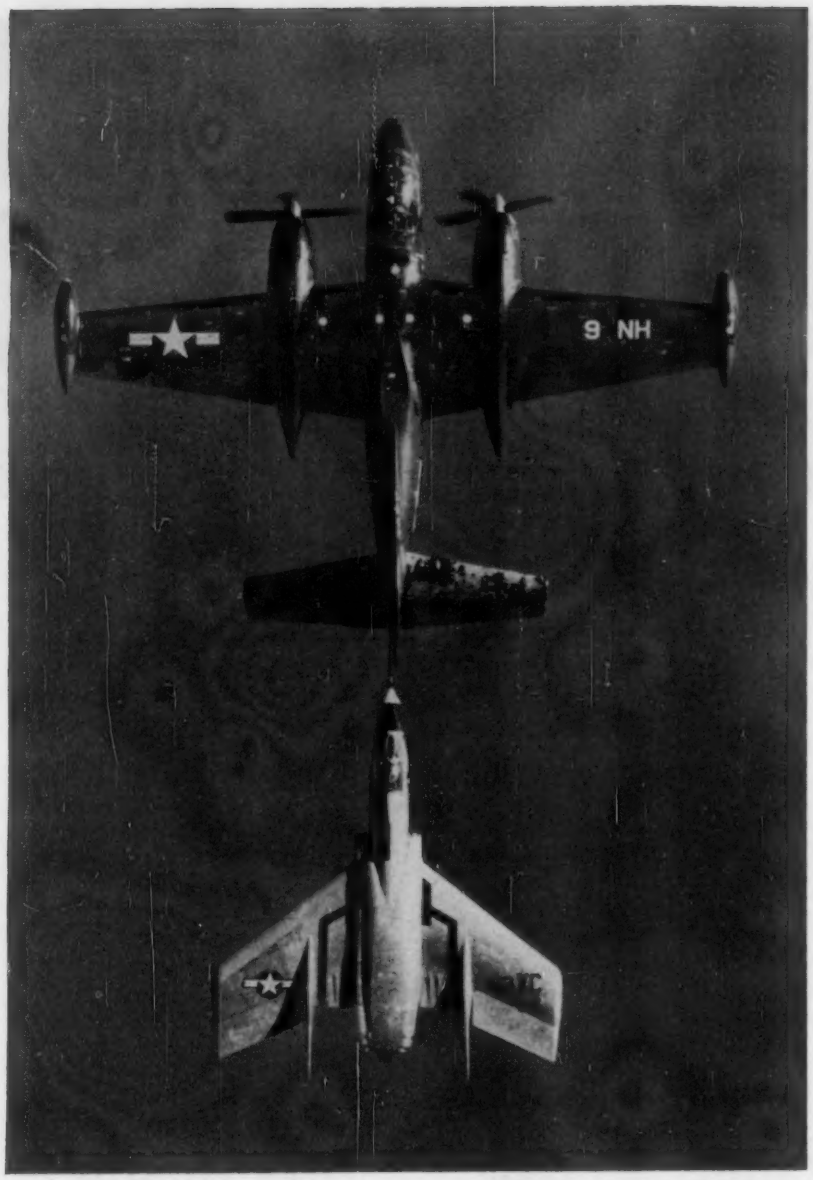
GRANTED:

**Wong Aviation Limited**, a foreign air carrier, permit authorizing irregular air transportation of persons and property between Toronto, Canada, and points in Michigan, Pennsylvania, Ohio and New York, for three years.

**Transocean Air Lines**, an exemption to perform one charter flight from Munich to New York pursuant to a contract with the Intergovernmental Committee for European Migration.

**United Air Lines**, an exemption to provide free transportation to technical employees of Radio Corporation of America for purposes of in-flight observation and monitoring of weather mapping radar equipment on scheduled flights, for six months from July 5, 1955.

**Wien Alaska Airlines**, an exemption to




# RANGE UNLIMITED FOR A CUTLASS

In almost the time it took VX-3 (The Navy's crack experimental development squadron) to take this picture during their recent maneuvers, this Chance Vought Cutlass extended its range many hundreds of miles by refueling from its North American AJ tanker-bomber using the Probe and Drogue system, developed and perfected by Flight Refueling, Inc.

The Navy's ability to extend the endurance of fighters changes the whole concept of range and effectiveness of carrier-based aircraft . . . the end result of years of pioneering in aerial fuel transfer by Flight Refueling, Inc.

## EXCELLENT ENGINEERING OPPORTUNITIES

The ever-increasing importance of mid-air refueling in jet operations has put Flight Refueling, Inc., in the focal point for much new development work in various types of refueling systems and related components. That's why a position on the FRI engineering staff holds great challenge and promise for imaginative engineers. Currently FRI has opening for engineers with experience in aerodynamics, hydraulics, electrical systems, fuel systems and aircraft structures.

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engage in scheduled air transportation of persons, property and mail between Fairbanks and Barter Island, Alaska, with authority to serve Barter Island as an intermediate point between Fairbanks and Point Barrow, as a terminal point on a Point Barrow-Barter Island route and as an extension of its present Fairbanks-Fort Yukon service alternate to its nonstop Barter Island-Fairbanks service, for a period of one year.

**Seaboard and Western Airlines** an exemption to transport one passenger on an otherwise cargo flight for the Aeon International Corp. from New York to Riyadh, Saudi Arabia.

**APPROVED:**

**Resolutions between various carriers** adopted by the International Air Transport Assn. relating to extension of the status quo with respect to the North Atlantic cargo rates to August 15, 1955.

**Agreements between** Continental Air Lines, Pacific Northern Airlines and various other carriers relating to intercompany arrangements.

**Agreements between** Bonanza Air Lines, Trans World Airlines and various other carriers relating to intercompany arrangements.

**DISMISSED:**

**Investigation and suspension** of certain fares filed by Currey Air Transport, Ltd., since the fares have been cancelled.

**Investigation and suspension** of certain fares filed by Great Lakes Airlines, since the fares have been cancelled.

**General Airways' application** for an exemption to perform one roundtrip flight between Portland, Ore. and Vancouver, British Columbia, at the request of the applicant.

**DENIED:**

**Northwest Airlines' application** to suspend service at Kalispell, Montana, or to eliminate Kalispell from Northwest's certificate.

**National Airlines' appeal** from rulings made by the examiner in the Eastern-Colonial Acquisition Case. National is granted leave to intervene in the case.

**Hawiian Airlines' application** for an exemption to permit it to provide free transportation to local travel agents for two annual indoctrination flights.

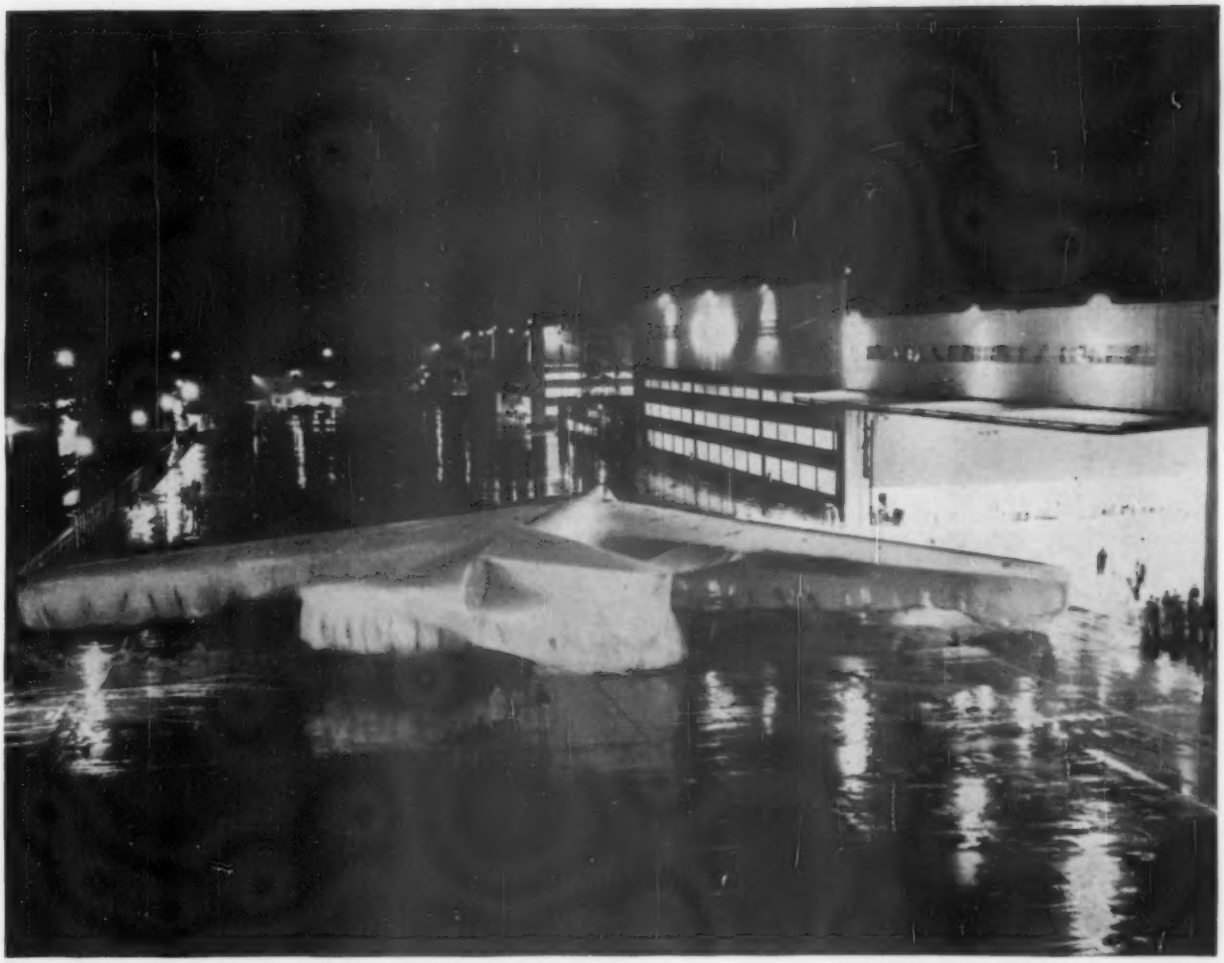
**Southwest Airways and Bonanza Air Lines'** applications for exemptions to serve various points in California and Nevada, since the issues are under consideration in the Southwest Renewal Case.

**Trans-Pacific Airlines' application** for an exemption to permit it to provide free transportation to local travel agents for two annual indoctrination flights.

# SHORTLINES

► **Air Transport Assn.** reports a passenger fatality rate of .20 per 100 million passenger-miles in domestic and international operations during the twelve months ending May 1955.

► **Airwork Limited** has added Dussel-



## Boeing engineers have vital and rewarding jobs

This is the Boeing B-52—mightiest of the world's jet bombers. The "wraps" are off it now. Some of the engineers—electrical, mechanical, civil and aeronautical—who designed it are now at work on the B-52's further development. Many others have gone to work on other "years-ahead" airplanes and guided missiles. But these new Boeing aircraft are classified, and cannot be shown here.

Engineers at Boeing have the satisfaction of vital jobs, where only endless experimentation can keep up with exacting demands. They stand at the top of their profession—thanks in part to highly advanced equipment like electronic computers, superb laboratories and research facilities, and the multi-million-dollar new Flight Test Center.

Boeing engineers can point with pride to recent developments like the B-47 and B-52 jet bombers, the KC-135—America's first jet tanker, and the IM-99 Bomarc pilotless interceptor. These Boeing engineers are now at work on widely diversified projects: rocket, ram jet and nuclear propulsion, supersonic flight, research in new materials, and many more. The result will be planes and missiles that will fly even faster, farther, and higher, and deliver an even greater punch.

These are evidences of Boeing's continuing growth—a growth made possible by uncompromising insistence on engineering excellence. Boeing employs twice as many engineers now than at the peak of World War II. But even more engineers are needed for Boeing's research, design and production teams.

If you want the satisfaction of doing an important job—if you want individual recognition and regular merit reviews—if you want to work with the finest equipment and the pick of the nation's engineers—then it will pay you to investigate career opportunities at Boeing.

• **JOHN C. SANDERS, Staff Engineer—Personnel**
• **Boeing Airplane Co., Dept. C-41, Seattle 14, Wash.**
• Please send further information for my analysis.
• I am interested in the advantages of a career with Boeing.
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• Name _____
• University or
• college(s) _____ Degree(s) _____ Year(s) ___
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## BRITISH EUROPEAN AIRWAYS REPORTS:

# Each Viscount produces $100,000 net profit a year

### Wherever the Viscount flies...traffic figures rise!

The profit-making capacity of the Vickers Viscounts flying for BEA demonstrates the truth of this maxim every day of the year. And every other enterprising airline that has added Vickers Viscounts to its fleet has similar success stories to relate. Air France: traffic up 25% to 30%. Trans-Canada Air Lines: traffic up 55%. Aer Lingus: traffic up 26%.

The only turbo-prop airliner in service in the world, the Vickers Viscount has established itself as the most *adaptable* aircraft of our times. Whatever the climate —tropic, temperate or arctic—whatever the size or competitive problems of the airline for which it flies, the Viscount delivers the same gratifying results. Traffic and load factors rise, operating costs are lowered and profits increase.

The Viscount's popularity with passengers is based on advantages they can immediately see, feel and enjoy. It has reduced flight times by as much as 30%. Virtually free from vibration the Viscount creates a new dimension in travel comfort.

Behind the new Viscount stand the great name and service organization of the Vickers Group—internationally famous as makers of ships, industrial machinery, heavy tractors and precision equipment.

*Capital Airlines will put Viscounts into service between Chicago, Pittsburg, Washington and Norfolk in July.*

**VICKERS**

**VISCOUNT**

built by VICKERS-ARMSTRONGS
powered by ROLLS-ROYCE

**VICKERS-ARMSTRONGS (AIRCRAFT) LTD.**
*Weybridge, England*

*United States Representative: Christopher Clarkson, 10 Rockefeller Plaza, New York 20, N. Y.*

dorf on its London-Frankfurt cargo route and has inaugurated service to Basle and Zurich. Dusseldorf is presently served by four flights in each direction weekly.

▶ **Alitalia,** Italian airline, will operate an experimental DC-6B service between Italy and Canada via London and Newfoundland this summer. Permanent service is planned for next year.

▶ **Avensa,** Venezuelan airline, has started twice weekly service between Miami and Maracaibo with Convair 340 equipment.

▶ **Avianca,** Colombian National Airways, has asked Civil Aeronautics Board to authorize a stop at San Juan, Puerto Rico, on its Colombia-Europe route. Service through San Juan would be in addition to present service via Barranquila, Bermuda, Lisbon, Madrid, Paris and Frankfurt.

▶ **British European Airways** operated 503 extra flights in the United Kingdom during the recent rail strike. Passenger traffic increased 45%, and BEA carried three times its normal volume of freight and five times its normal volume of mail.

▶ **Cyprus Airways** has inaugurated a weekly air service between Cyprus and Damascus, the first direct air link between the two points.

▶ **Delta Air Lines** reports gross revenues of $54,127,000 for the 11 months ending May 31, 1955. Net earnings were $1,765,000, equal to $2.94 a share.

▶ **International Air Transport Assn.** had clearing house business of $72,057,000 in the first quarter of 1955, a 28% increase over the same 1954 period.

▶ **Japan Air Lines'** summer schedule has three flights weekly on its San Francisco-Honolulu-Tokyo-Hong Kong route.

▶ **KLM Royal Dutch Airlines** carried 126,641 passengers in the first quarter of 1955, a 7% increase over first quarter 1954. Freight traffic was up 15% in the same period.

▶ **Lai,** Italian airline, has started a new service between Rome and Frankfort via Venice and Munich. Four flights will be operated weekly with Convair equipment.

▶ **Lake Central Airlines** carried 10,398 passengers in May, an increase of 19% over April traffic.

▶ **North Central Airlines** carried 37,891 passengers in May, a 69% increase over the previous May. Load factor rose from 44% to 50% in the same period.

UNDER WAY

... the development of NUCLEAR AIRCRAFT at CONVAIR--Fort Worth

Progress is being made in the Applied Nuclear Field at CONVAIR — Fort Worth — in nuclear analysis, design and experimentation, including the fields of shielding, radiation effects and nuclear aircraft technology.

As an integral part of General Dynamics Corporation's program of pioneering in Nuclear Fields, CONVAIR'S activities afford inviting opportunities for engineers and physicists to enter into Nuclear Development at its most advantageous stage.

CONVAIR'S Nuclear Program offers highly rewarding career opportunities both by way of professional accomplishment and personal income. A company-sponsored, in-plant program enables candidates to earn graduate degrees in Nuclear Engineering.

Fort Worth in the Great Southwest has an abundance of sunshine and dry, fresh air conducive to outdoor living and recreation. Within a few minutes drive of Fort Worth are seven large lakes which provide ample facilities for fishing and other water sports.

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CONVAIR Engineering Personnel Dept. RR
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Here's your opportunity to work in an organization where your own ideas can be put into working reality. All American Engineering's progressive management has provided an ideal environment where engineers work individually and in groups . . . constantly searching for solutions to the stimulating problems facing the aviation industry today!

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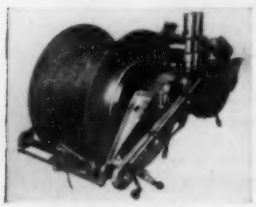
**put your ideas to work at**

# All American ENGINEERING COMPANY

All American Engineering Company offers an unusually flexible design and engineering service to the aviation industry and the military. Among the many important developments of this dynamic organization are the famous hydro-ski, tow-target and air-sea rescue winches, in-flight refueling systems, ejection seat trainers, experimental impellers, portable mooring mast for airships, many types of arresting gear, catapult devices, air pick-up equipment and the solutions to various problems of energy absorption.

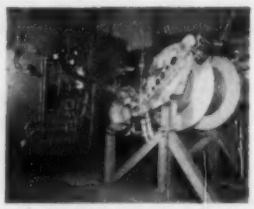
The unique and important talent of All American's engineers to research and design right to the vital issues of each problem means a minimum of lost time and wasted activity. This, of course, results in maximum satisfaction and savings to the company's numerous clients in both industry and government.

THIS IS ALL AMERICAN



The All American light weight Model 63 winch is used for airborne hoisting and in-flight re-manning.

This 75 foot winch test tower is capable of simulating flight conditions and loads up to 30,000 lbs.



This laboratory at the foot of the tower is used to test winches with both hydraulic and electrical drives.

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*All American Engineering Company*

DUPONT AIRPORT • WILMINGTON, DELAWARE


► **Northwest Airlines** reports its turbo Constellations have cut one hour and ten minutes from the scheduled time between the Pacific Northwest and Hawaii.

► **Pan American World Airways** has increased its service between Houston and Mexico City to two flights daily.

► **Qantas Empire Airways** plans to inaugurate daily all-cargo service between Australia and Britain with Super Constellation and Skymaster equipment by the end of the year.

► **Silver City Airways** has opened an air ferry route between Liverpool and Belfast.

► **Sudan Airways** has inaugurated regular weekly service between Khartoum and Beirut via Cairo.

► **Swissair** carried 58,451 passengers in May, an increase of 15% over May, 1954. Cargo was up 34% and mail up 21% . . . Swissair has increased Zurich-Vienna schedules to two round trips daily.

► **Trans-Canada Air Lines** will offer 28% more seat-miles this summer than in the summer of 1954, and 52% more than it offered last winter.

► **Trans Caribbean Airways** has added two DC-6A and two C-46F aircraft to its fleet, bringing the total to ten.

## Cuban Airline Chief Plans New Expansion

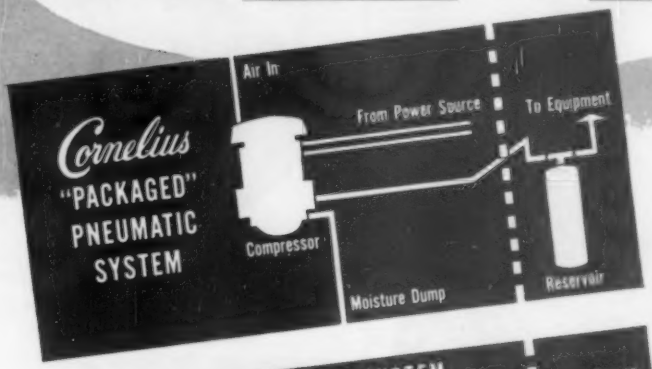
**Havana**—Route expansion and acquisition of new aircraft are part of the "reorientation" planned for Cia Cubana de Aviacion by its returning president Jose Lopez Villaboy.

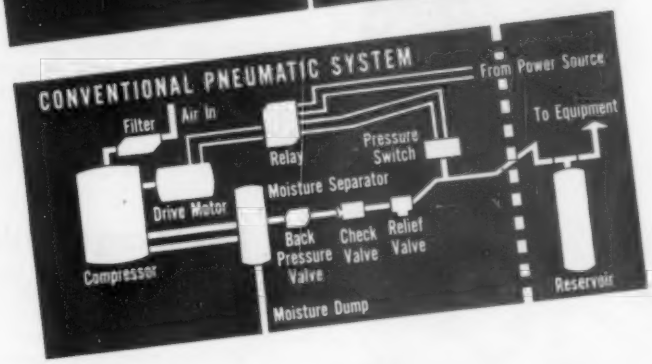
Villaboy, who had been on "leave of absence" after the airline was taken over by the Cuban Government's Agricultural and Industrial Development Bank (Banfaic), criticized the organization's management of the airline and said it had lost the company over $1.5 million. Majority control of the airline was resumed by stockholders gaining majority control with the aid of the labor unions involved and another government bank.

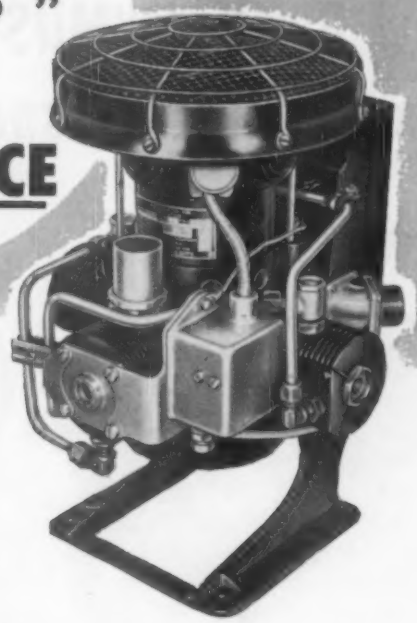
Airline sources report that the bank has taken over Cubana de Aviacion's obligations to Banfaic, estimated at $3 million and the unions have agreed to a 15% wage cut to make up in the form of company stock issued to the union over the next three years. Villaboy has named Juan M. Palli, former Delta-C&SA Airlines public relations staffer, to be vice president-general manager of the Cuban airline.

# Cornelius

## "PACKAGED" PNEUMATIC SYSTEM SAVES WEIGHT and SPACE



*The Cornelius Compressor, Model 130, 2CFM, 3000 PSI, is used in the McDonnell F2H-3 and F3H, North American FJ-2, FJ-3 and FJ-4, Chance Vought F7U-3, Grumman F9F-9. Also on order for the Lockheed P2V, Grumman S2F and Martin P5M. Thousands of service hours under all operational conditions is proof of outstanding performance.

**The Cornelius Model 130 compressor* is the heart of the complete Cornelius "packaged" pneumatic system which includes inlet air filter, starting relay, radio noise filter, moisture separator with automatic condensate dump and heating element, back pressure valve, check valve, relief valve and pressure switch.**

**Compact Design Saves Space**—Entire air supply system occupies only slightly more space than compressor alone in conventional system.

**Weight Savings** of 5 pounds or more are possible by eliminating separate system components, associated tubing, fittings and flare connections.

**System Leakage Is Reduced** to a minimum because integration of components removes possible leakage sources such as flare connections and o-ring sealed fittings.

**System Reliability Is Assured** because each integral component is designed specifically to give optimum performance in combination with the other components.

**Time Saved** by installation and servicing of *one* unit is another valuable benefit which only Cornelius "packaged" pneumatic systems offer.

The Cornelius "packaged" pneumatic systems are available with either DC, AC or hydraulic motor drives. Please write us in order that a Sales Engineer may discuss with you the application of this "packaged" system as well as the many other pneumatic components which we manufacture.

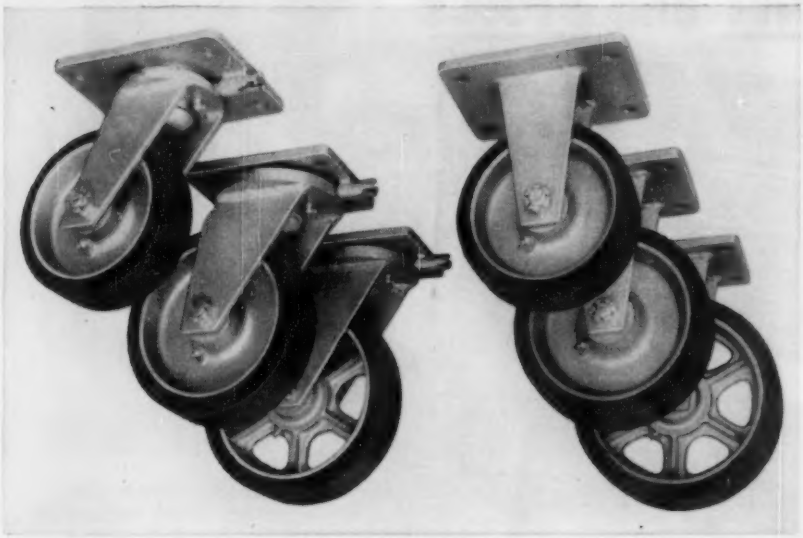
**THE CORNELIUS COMPANY** 550 - 39th Ave. N. E., Minneapolis 21, Minnesota

PIONEERS IN THE DEVELOPMENT OF AIRCRAFT PNEUMATIC SYSTEMS

# MATERIALS-HANDLING NEWS

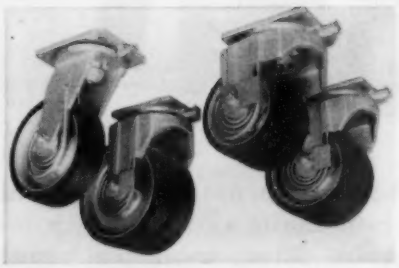
★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

## New Bassick "MilSpec" Casters meet military specifications



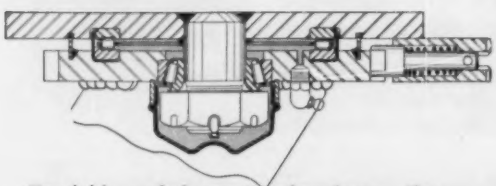
Bassick's new "MilSpec" line is specifically designed and engineered to meet the requirements of MIL-4749 and MIL-C-4750 for precision swivel and wheel bearings, sealed bearings, adjustable swivel bearings.

The new line includes 8, 10 and 12 in. heavy-duty, swivel and rigid casters for both inside and outside service on either hand- or power-pulled materials-handling equipment.

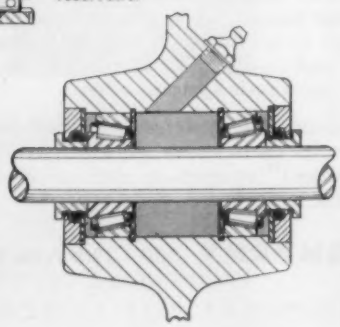


The swivel bearings are self-contained, precision units of the highest quality. Wheel bearings are the finest tapered type. Threaded king bolt and slotted nut construction make fine adjustment of swivel bearing possible.

## "MilSpec" sealed swivel and wheel bearing assembly



Gray areas show lubrication reservoirs.



Bassick's sealed construction keeps dirt, water and foreign matter out of both wheel (right) and swivel bearing (above) assemblies of "MilSpec" casters. Protective lubricant stays in to prolong life and insure easy action. Alemite pressure-type grease fittings permit flushing and re-greasing with standard grease guns.

## *MilSpec "Floating-Hub" Caster gives safe ride*

Important in the new "MilSpec" line is Bassick's famous "Floating-Hub" caster.

### Smothers shocks

It combines the shock absorption of "Floating-Hub's" sprung-wheel construction with the precision quality of "MilSpec" casters. MilSpec "Floating-Hubs" give any load a safe ride — should be first choice in handling any equipment subject to damage in moving.

### Tops on rough terrain

They're also better suited for higher speeds and rougher terrains than ordinary casters. And with adjustable precision sealed bearings, MilSpec "Floating-Hubs" will stay on the job long after lesser casters call it quits.

### Write for information

Write to Bassick for printed data on the new "MilSpec" casters. Remember — an original investment in quality casters pays off in added years of trouble-free, money-saving performance. Specify Bassick casters and you'll be sure you have the best.

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# EDITORIAL

## Kidding the Public on Russian Airpower

The latest Russian air show over Moscow (see page 13) is the second formal display of five new types of long range jet bombers and high speed jet fighters in a few months. This air show in honor of Red Air Force Day was held at Tushino Airport near Moscow in an atmosphere not far removed from the great Western airpower exhibits at Le Bourget, Farnborough and our own traveling National Aircraft Show to be held this year at Philadelphia.

The fact that these four great powers hold major public demonstrations of both military and civilian aircraft is an indication that they feel, even in the Russian dictatorship, that popular support and pride in their national aviation is an essential ingredient to its success and progress.

The manner in which these air shows and those in the smaller countries such as Holland and Switzerland also are used to create international prestige is a significant measure of how national airpower now rates as an index of national prestige and strength.

The issue of whether the United States or Russia is superior in the air today, tomorrow and in the years to come is a matter of vital interest and importance not only to the citizens of these two powerful nations but also to their allies and the neutral peoples who have not yet decided which political philosophy they will support.

It is obvious that the necessity for a well-informed public opinion on the relative merits of U. S. and Russian airpower has assumed vastly increased importance in recent years. Thus, it is discouraging to find Defense Department information policies aimed at providing vague and misleading generalizations about the progress of Russian airpower and less and less information on the progress of our own air effort even on matters where the government authorities agree no military security is involved.

Let us look at some of the worst examples of how the government has denied the American people access to information about Russian airpower. First, take the case of the captured MiG-15 fighter flown into USAF hands by a North Korean defector in 1953. This cost U. S. taxpayers $100,000. The MiG-15 was the standard Russian and Chinese jet fighter in the Korean war. It was in combat against USAF's F-86 Sabres and Navy Panthers and Banshees for more than two years.

Yet, when the MiG-15 finally arrived in U. S. hands, it was treated as though it was top secret information. USAF was perfectly willing to allow the American press to inspect the captured MiG-15 in detail, but it was over-ruled by a top level government interdepartmental co-ordinating committee that included representatives of Defense and State Departments and the Central Intelligence Agency. To this day the MiG-15 and the facts on its design and construction have been kept secret from the American people.

A few weeks ago the Defense Department attempted to conceal the complete facts on the Russian May Day flying display over Moscow with a vague and misleading press release.

Further inquiries by reporters covering the Pentagon were brushed aside by the top level Defense Department bureaucracy. Only through aggressive reporting by AVIATION WEEK, the Washington Star, the Chicago Tribune and the Alsop brothers, backed by pressure from Senators Symington, Russell and Jackson, were the complete facts revealed to the American people.

These facts were so shocking to the Pentagon and top level government officials that an immediate acceleration of 35% on B-52 bomber production was ordered. A few weeks later another decision was made to speed production of the F-101 and F-104 supersonic fighters. These decisions were made to meet the challenge of the increasingly rapid Russian progress in modern airpower and its atomic weapons. The implication is quite clear that neither of these two decisions would have been made without the public furor that followed disclosure of the complete facts on the Moscow fly-by.

Now the Russians again have flown their Bison and Badger jet bombers, the Bear turboprop bomber and the supersonic Farmer fighters publicly in significant quantities.

But the Pentagon is still concealing from the American public the pictures it has of these planes on public display over Moscow. It is resisting all attempts both from the press and Congress to make public these pictures.

Whom are they trying to keep in the dark on these Russian planes? Not the Russians—they have seen them publicly over Moscow many times in the last few months. Not foreign observers—they too have been spectators at these Russian air shows. Only the American people remain in the dark, and it is apparently Defense Department policy to keep them there.

One argument against releasing these pictures is that it would reveal the source of U. S. intelligence. This is utter nonsense! Everybody knows they were taken by American and other foreign observers in Moscow during the displays. Lest there be any doubt as to who took the pictures the Russians had camera crews on the Moscow rooftops taking pictures of the foreigners who were taking pictures of the Soviet planes.

A more probable reason for not releasing the Russian pictures is that once they appear in the public prints, it will be difficult to conceal the truth about how modern the Soviet designs really are and how close they are to our own modern aircraft. Now top level Defense Department officials can go quietly to congressional committees in executive session and "pooh-pooh" the performance of these new Russian aircraft. If these designs were printed publicly, thousands of American aeronautical engineers would see them and effectively provide technical rebuttal to the Pentagon evaluations.

The Defense Department must either release the Russian aircraft pictures or face the consequences of a rapidly growing public suspicion that it is making information available only when it suits its own narrow purpose. This inevitable loss of public confidence in Defense Department policies would be a danger to the future of this country far greater than that any foreign power could inflict.

**—Robert Hotz**

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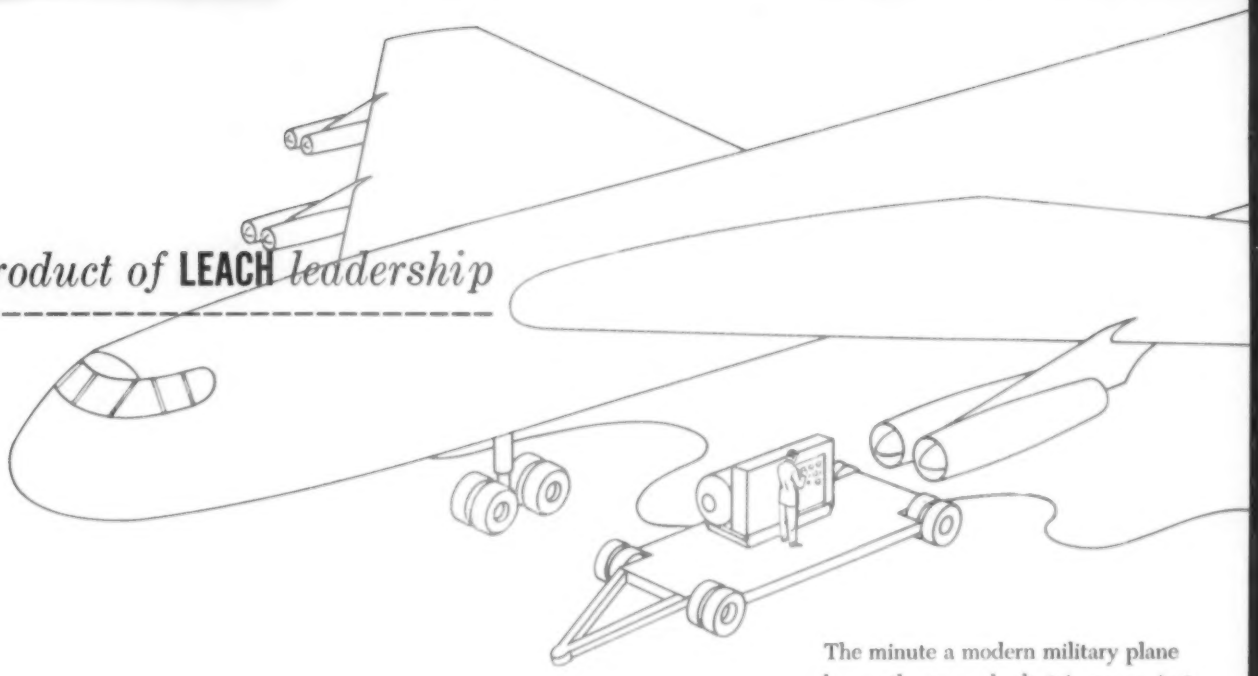

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| Overload Rating | 78 KVA, intermittent |
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| Voltage | ± 1% |
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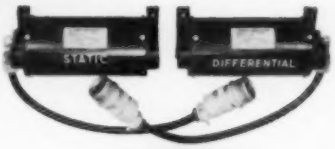


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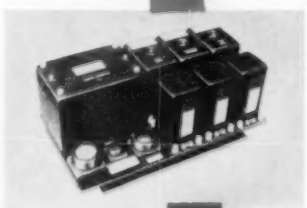

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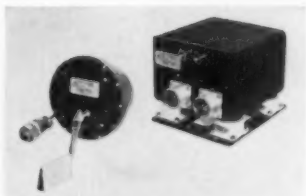

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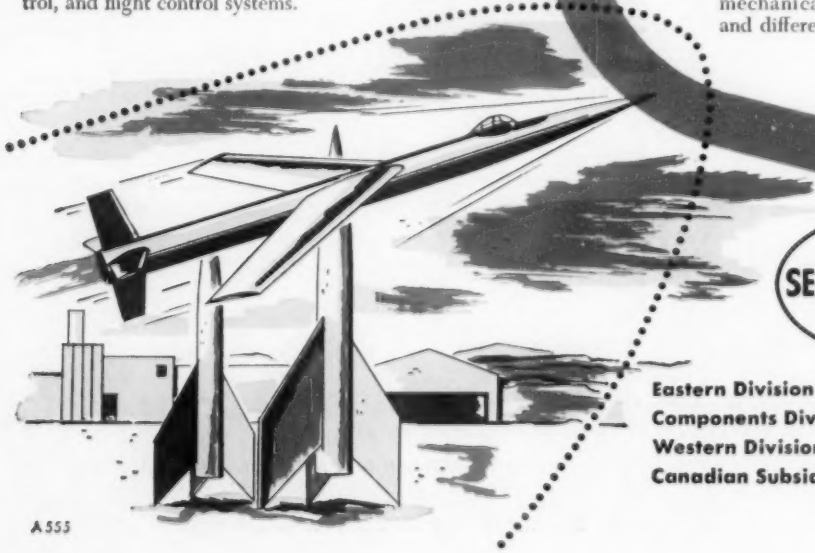

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